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Register of Patents, Correspondence, and Parliamentary and Legal Intelligence.

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SIR GEORGE LIVESEY.

OUR friend is dead. A great life has been spent, a great work has been done, and the world in general and the gas industry in particular are the better and the richer for that work. It is with full and heavy heart that we have now to write; and this week we will discharge as briefly as possible the duty imposed upon us by the irresistible hand of Death.

Sir George Livesey passed away last Sunday, after a confinement to his house extending back no longer than to Friday, Sept. 11. The previous day he was in the "JOURNAL" offices—looking unwell, but with his interest in all that was passing in the industry that claimed him as its own as keen and active as ever. An internal growth was the cause of this illness, and that growth deranged certain organic functions in a manner that sapped strength, weakened vitality, and brought what was once the strong constitution down to such an enfeebled condition that the patient rapidly sank.

Sir George was 74 years of age; and there are few of his early contemporaries who took prominent part in the work of the gas industry who have survived him. His life in, and his services to, the gas industry were altogether unique. He was, particularly in the past thirty years, the central figure in that industry—may we not say both at home and abroad?—and the leader in all movement that had for its purpose the solidification of the foundations of the industry, the broadening of its usefulness and service, and its general advantage commercially. He was jealous of the interests of the gas industry; and nothing was too great for him to venture in its behalf, if it, from the aspects of justice or utility, struck any one of the chords in the great complex character possessed by him whom we all revered for his personal goodness and his genius—a goodness and a genius that were exercised with self-abandonment, almost to the very end, in the common interest, and without thought of personal aggrandisement.

Earnestness dominated all he undertook. He did not claim infallibility; but he could have claimed that all he did had its conception in a conscious right. He was not a man who sought out opportunities for work; his active brain directed to work. Initiation and means of execution pursued each other with vigour through his restless, constructive brain. Whatsoever his hand found to do, he did with all his might, and out of pure love for the work.

As an engineer, as an administrator, as a parliamentary fighter in the causes of the gas industry, he led; and in the great humane cause of labour, which lay so near his heart, his fervent spirit carried him over all obstacles. He was a leader of men; and he was a leader in work—faithful to trust and persistent in effort. He has bequeathed us much; and his work in the gas industry and in the cause of labour will stand as an imperishable monument.

For the day, we will lay aside the pen; and, in spirit, with all of the gas industry who counted him as friend, who admired the great soul of him who is now at rest, stand, with the multitude of her lamented husband's friends, beside Lady Livesey and the other sorrowing relatives, in the shaded lights of the home that was loved so well by him at Reigate.

The "Helps v. Livesey" Libel Action Withdrawn.

READERS of the "JOURNAL" are aware that Mr. George Helps, of Nuneaton, some time back commenced an action for libel against Sir George Livesey, in regard to certain statements made in the columns of the "JOURNAL" and also in a letter addressed by Sir George to the Chairman of the Nuneaton Gas Company. This case had been set down for trial; but we are very gratified to learn that on Friday last a message was conveyed to Lady Livesey to the effect that the action had been unconditionally withdrawn, as Mr. Helps—in view of the circumstances, and recognizing the great services which Sir George had rendered to the gas industry—felt he could not possibly proceed with it.

The Funeral Arrangements.

THE funeral will take place at 3.15 on Saturday afternoon, at Nunhead Cemetery. As the cemetery is so accessible to London, no memorial service will be held in town. Trains to Nunhead Junction, on the Crystal Palace High-Level line, leave Victoria at 2.23, and St. Paul's at 2.25.

Under Present Parliamentary Practice.

ANYONE who has followed studiously the review of the Gas Acts of the session which has been made in the "JOURNAL" in the last two issues and the present number will possibly have been struck by two or three noticeable features concerning the present practice of Parliament. In the review, an attempt has been made to indicate wherein Act differs from original Bill; and, taking a general survey of these differences, it shows that the parliamentary authorities have set their faces sternly against innovation, unless it be of their own introducing. We are confident they are not always correct or just in too rigidly making custom or precedent the arbiter of right and wrong, though, it must be said, as a point in favour of their practice, that we are getting thereby nearer year by year to uniformity of enactment among gas undertakings. Very few promoters have got clauses through this last session that are a departure from the model form; but we are not prepared to speak harshly of the rigidity practised in this regard in view of the fact that the parliamentary authorities have, the last two or three years, given us some excellent and far-reaching revisions of model clauses—such as the illuminating power testing clauses, the option of the discounts clause or the extension of section 13 of the Gas-Works Clauses Act of 1847, and the new auction clause, which abrogates the restriction contained in the old not-below-par provision in relation to the issue of new capital. We are not so enamoured (for reasons already stated in the "JOURNAL") of the new special purposes fund clause which has unseated the insurance fund and the renewals fund clauses. The new auction clause during the progress of the Bills in Parliament this year was consistently applied where fresh capital powers were sought. But the special purposes fund was not insisted upon so rigorously, though in all cases (except the Draycott Act) where a renewals fund appeared it was stamped out without much ado; and the same where an insurance fund was asked for, save in the Bromley Act, in which provision stands for such a fund. In certain Acts, too, there has been a limitation of the balance of undivided profit to an amount equivalent to a year's dividend.

The limitation here and the limitation there in the matter of funds and "carry-forward," seems to be somewhat unnecessary in face of the almost general adoption by Company promoters of the sliding-scale clauses. These clauses are far greater safeguards to the consumer, and give a greater assurance of financial soundness than all this egregious financial tight-lacing, which, in the flights of the imagination of the inexperienced mind, is believed to inure to further security for the consumers. But they all tend, in view of the sliding-scale protection, to lumber both legislation and trading without doing any good. For instance, there was much time wasted in the past session over the renewals clause, and the drafting of the clause providing for the special purposes fund. But what good has it all done? There has not been any evidence of the possession of these separate funds, earmarked for the specific purposes implied by their titles, having done a jot of damage to the consumers of gas supplied by Companies working under the sliding-scale; but the superseding clause has imposed a stupid form of control over the expenditure of the fund, and has granted authority for the utilizing of the reserved money for capital purposes which, if acted upon, would take away all the protective power of availability when invested in readily marketable securities. If, instead of wasting time on supplanting old clauses by defective new ones, the parliamentary authorities would set themselves to iron out some of the statutory differences existing between electricity and gas, the gas industry would raise no objection. For example, in the local authority Acts that are under review this week, it is seen that the Electricity Departments get protection against persons having an independent supply of electricity, who are desirous of having the town service connected up merely as a stand-by; and, under this protection, such persons are not entitled to demand a supply unless they agree to pay such a minimum annual sum as will give the electricity undertaking a reasonable return on the proportion of the capital expenditure and the standing charges incurred by the Corporation as is properly attributable to the possible maximum demand. Though for the most part independent electricity plants are driven by gas-engines, we agree with the fairness of the provision. But to grant the protection on the one hand to electricity suppliers, and to deny it on the other to gas suppliers in respect of privately owned producer and suction gas plants, is a piece of inconsistency that is yet awaiting the defence of the parliamentary authorities. While speaking of the variations between gas and electricity enactment, it is noticed that, in the case of municipal electricity supply undertakings entering upon the wiring and fitting business, the provision is now being commonly applied which orders that the charges for work and fittings are to be made so as to at least equal expenditure, including interest and sinking fund, and that separate accounts are to be kept for this department. In the case of the Wath and Bolton Gas Board Act, the same provision has been applied to the supply of gas-fittings.

Some of the departures from established custom introduced in the Bills for the session were not of a character that altogether met with approval when first under notice; and we now see there has been short work made of these by the parliamentary authorities. For example, there was the proposal of the Keighley Corporation (which was strongly condemned in these columns when the Bill was published) to make up deficiencies on the unprofitable municipal trading undertakings from the profits on the successful ones. The use to which such a power could have been applied, to the injury of the consumers of the profit-producing undertakings, is too obvious to allow of the commendation of any such plan. Again, Blackburn asked to be allowed to use their dual ownership of the gas and electricity undertakings to deprive non-payers of accounts for one commodity of a supply of both. But, and quite rightly we think as a matter of principle, the Committee by whom the question was considered decided that the undertakings should be treated precisely as though under separate ownership. Thus in the rejection of both the Keighley plan for the robbery of successful undertakings to bring about compensation of the deficiencies of other concerns, and of the Blackburn proposal, we have the establishment of the principle by Parliament that, though a municipality may have bunched together under their control a number of trading ventures, each one is to be regarded as an entity, and be treated on a distinct financial base of its own. A little extension of this principle, and the expenditure involved in local administration could be treated in precisely the same way; and the inequality in the incidence of taxation (produced by the allocation in aid of the rates of profits from a profitable undertaking) would be cancelled by the profits being used exclusively for the benefit of the concern and the people patronizing it. By an enlargement, too (to embrace an undertaking as a whole), of the expenditure and income equalizing provision applying to the supply of fittings—after the manner and prescript of the Northumberland clause—we should have municipal trading governed on business and ethical lines.

Not only in connection with municipal measures, but in company ones has Parliament during the session set their hands effectually to the overthrow of innovation. In three Bills, Parliament were asked for a standard illuminating power for gas of 12 candles; but either through the parliamentary authorities, or the process of allaying opposition (if not done through the latter, it would have been by the former), the projected 12-candle standard has disappeared, and that of 14 candles, at which the parliamentary line has been drawn for the time being, has taken its place. Then the Swinton and Mexborough promoters, on the change of their estate from that of a limited Company to that of a statutory one, sought to relieve themselves from the payment of stamp duty to the Inland Revenue Commissioners. The subject has been a vexed one for some years, and has been in the Law Courts quite recently, with a favourable result to the Inland Revenue Commissioners; and now Parliament, in the Swinton case, declines to give special exemption. The Padiham Urban District Council also tried to make unprofitable prepayment consumers profitable by seeking power to charge those using less than 3000 cubic feet a quarter, an additional rent; and the Bromley Gas Company sought to make prepayment consumers responsible for money placed in their meters until collected. Neither of these suggested new powers was allowed. But the Swinton and Mexborough Company have got Parliament to give them the right, if they think fit, to require a deposit of 1s. per quarter for a prepayment meter, "providing that the amount col-"lected from the prepayment meter during such quarter "shall be applied in the first place in refunding the deposit "to the person who has paid the same." There is little value in this; and attempts to apply it will, we imagine, cause more trouble than the shilling is worth. Two or three permissive clauses relating to purchase are found in the Acts; and, as will have been seen from the detailed review

of the general provisions, the usual adjustments in capital and other matters have been made to satisfy Committees and local objectors.

Long Service—Technical Training.

WHILE in the life of the individual there is finality, in science, in technical knowledge, and in the gas industry there is not. These words are, in effect, a repetition of some used by Sir S. A. Sadler at the complimentary dinner given on Saturday by members of the North of England Gas Managers' Association to Mr. William Ford, the Engineer of the Stockton Corporation Gas-Works, who occupied the Presidential Chair of the Association nearly thirty years ago and is in it again this year. The words of Sir Samuel were appropriate to the occasion, when we remember what forty years' continuous active professional service in a single lifetime and in one employ means and portends, and when we review all that has happened scientifically and materially in the gas industry during those years, impressing unceasingly its limitless character. It may not be commonly known that Mr. Ford succeeded Mr. Corbet Woodall at Stockton in January, 1869; and for many long years, he has been one of the men of distinction in the town—loved for his kindly disposition, and admired for his successful management of the great trading concern which the Corporation possess in the gas undertaking. The personal traits recognized so freely by the Mayor, and by the Chairman and Members of the Corporation Gas Committee, on Saturday, are precisely those that have endeared Mr. Ford to all who are connected with the British gas profession, of which, being now threescore years and ten, he is one of its active seniors. The greater proportion of those who are responsible for the local government of Stockton are men who have been schooled on commercial lines, and who to-day, in private and public affairs, regard most matters purely from the commercial standpoint. In considering Mr. Ford's services to the town, they look first at them from the aspect of productiveness, and admire the man who has shown in the undertaking he manages a sale of product that has multiplied by five that existing when he commenced his management. In the period of service, too, the price charged has been reduced considerably; and though £160,000 of capital has been expended in the period, the average unredeemed capital per ton of coal stands (or, rather stood at the time of the last returns given in the address read by Mr. Ford on Saturday) at only £2 14s. 7d. per ton of coal carbonized, while the amount transferred to the relief of the rates (which is a controversial matter that may be allowed repose on the present occasion) has been of considerable amount.

Mr. Ford was one of the founders of the North of England Association; and he has been one of its most robust supporters from the very beginning. His address took us back to the early days of the organization. It was almost purely historical in character—the facts being drawn from the records of the Association and from the tablets of the writer's own memory. Wandering, in mind, over the paths of the past in this way causes one to ponder. There is no finality in science, in technical knowledge, and in the gas industry, says Sir Samuel Sadler. For the gas industry, there may be a vaster store than we know of waiting to be opened out in the future. This it is not given to human eye to see. But we do know that, whatever the store contains, the key to it is knowledge. We also know that the fight that lies before will be sterner than anything that has been met hitherto; and those who are equipped for the fight in the best possible way are those who will take the foremost place in discovery, will rise to the highest distinction, and will win most in the struggle. To assist in the laying of the foundation of knowledge that will render aid to these ends, is the object of the Department of Fuel at the Leeds University over which Dr. Bone presides. Of the work that is being entered upon there, the President spoke in his address, and Dr. Bone at the short business meeting also referred to it, and asked for—not money but students. What the department needs most at present is the living material upon which to commence the tuition work; and those gas engineers and managers who have sons ready to start on life's serious work can now help forward the movement by sending their sons to Leeds. Another simple request is made by Professor Bone; and it is that it would be useful, in order that arrangements of an adequate character may be made, to know approximately how many students there are likely to be going to Leeds during the next two or three years. Any indication that readers can individually give in this direction is not intended to be in any way binding, but merely to act as a guide to those responsible for the work in these introductory stages. It must be remembered that new ground is being opened up at Leeds; and if the friends of those engaged in this movement will help them in the taking of levels and soundings, it will afford some idea of what has to be prepared for in establishing and settling down to work on approximately normal conditions. It is not a great thing that is asked by Professor Bone in respect of this information; and we give it this prominence in order that the desire may be as widely known as possible.

Technical Proceedings at the Welsh Meeting.

IT was a chatty and informative address with which Mr. Thomas Acland, of Llanelly, inaugurated, on Wednesday last, his year of office as President of the Welsh Association. He finds himself, as we all do, surveying the position and prospects of the gas industry, from the competition outlook, with feelings of supreme contentment; and the territory still open—more to gas than to any competitive agent—for business exploitation is in his eyes fair to look upon. We find this by passing direct from his opening expressions of contentment to the portion of the address in which he deals with management, and shows the effective and paying work he has accomplished in Llanelly by what he terms his "free instal-"lation" plan. This is a nominal distinction that has no real claim to the title in fact. With Mr. Acland, a "prepay-"ment" meter supply stops short at the meter; the "free "installation" plan incorporates fittings, for which 10d. excess on the price of gas is charged. This tenpenny excess suggests to us that the titular word "free" recedes from its proper meaning in positive proportion with the pace of consumption. We will therefore group all users of gas who prepay under the generic term of "prepayment" consumers. The President quotes some figures, in connection with the various classes of gas consumption, that are uncommonly interesting, in that they show that next to gas-engines, the prepayment consumer is the most uniform customer summer and winter that he has connected to his mains. There are various reasons for this; and one important one no doubt is that Mr. Acland includes a cooker in his prepayment equipment. The habits of the greater number of the prepayment consumers has a striking effect on this question. The living room is in most cases the kitchen. The gas-cooker offers quick and ready means for preparing food in the summer, when the hours of lighting are reduced. In the winter, the kitchen fire is alight for warmth; and in the interests of economy its heat is also utilized for cooking. Then, however, the hours of lighting are longer; and so comes the fairly straight line in the curve of consumption to which Mr. Acland draws attention. We agree with him that for this reason alone these prepayment consumers are excellent patrons; and until electricity can offer them the same comprehensive service and as cheaply as gas—through a meter fed by a single low-valued coin—for lighting, cooking, and heating, there is not much chance for the competitor. The convenience of the cooker and top boiling-rings strongly appeals in the workman's home. In this direction, Mr. Acland has done excellent work for his Company; and the scope is yet good.

Among other commercial topics treated upon were the position of the bye-products markets and the possible effects of the Coal Mines (Eight Hours) Bill. Mr. Acland has added to the knowledge on the latter subject, by canvassing for their opinions some of the principals of large colliery undertakings in the Welsh coal-field, among whom, it will be seen, there is a oneness of view that the eventual operation of the Bill must, however considered, add to the price of coal. We would, however, point out to the President wherein we think he is not quite logical in his deductions concerning the future effects of the measure, if passed. In one place he tells us that he does not share the pessimistic views of those who put the possible increase in the price of coal due to the Bill at 1s. 6d. or 2s. per ton; and he rather inclines to the belief that from 4d. to 6d. will cover the extra charge that can possibly be attributed to this cause. This optimistic view all in the gas industry hope will be consummated. But the Bill has not yet become law; and earlier in his treatment of the subject, Mr. Acland says: "There is "no doubt the Bill is mainly responsible for keeping up the "price of coal, notwithstanding the depression in trade, so "that this year's contracts could only be made at a little, if

"anything, below last year's." If the Bill has this effect before it has received the Royal Assent, what effect is it likely to have afterwards—the 4d. to 6d. advance, or the 1s. 6d. to 2s.? We think the lower figures are the product of a highly benevolent disposition.

Reverting consideration to the fore part of the address, the remarks by Mr. Acland on the question of carbonization in vertical retorts, rather betrays an inclination to look disparagingly on the continuous method of operation, and on superficial reasoning to pronounce adverse judgment. The continuous system, he remarks, "has apparently nowhere "met with success." The weight of this pronouncement, of course, depends on the meaning placed on the term "success." If the present relative degree of adoption is taken as the test, then, there is no denying that, the intermittent system has got farther along the road; if technical result is to be the arbiter in judgment, then the continuous system is not without promise of achieving great success. But it must be remembered by all who deal with this subject that, productively the continuous system has proved its success; and that the slow development has been due entirely to the evolution of a composite mechanical system that should be free in all parts from inherent weakness and difficulty. It is not of the character of engineers who are at all worthy the name, when they have proved an excellent productive result, to beat a retreat on mechanical grounds alone; and there is hope that larger trial will confirm the success of the single retort on the latest plans as tested at Poole, and that the great care that has been bestowed on the planning of the St. Helens plant will, before long, accentuate by the result the confidence of its projectors. In two or three places in dealing with this question, Mr. Acland exposes himself to attack, especially where he suggests that with steep inclined retorts "the heat can be applied more regularly" than in the case of vertical retorts. There is no engineering difficulty in heating vertical retorts just in any way desired—uniformly or by graduated heat in their length.

There was one paper read at the meeting. The author is Mr. J. Mogford, of Briton Ferry. The worries and trials of a man in charge of a small gas-works make interesting reading for even the man who sits in one of the seats of the mighty—professionally—in the gas industry. Comparison with his own experiences is entertaining—perhaps instructive—just as it is for the working manager who fills all the *rôles* of occupation from manager to mainlayer and collector to read of the worries and trials of the man who has responsibilities of the first magnitude. Mr. Mogford sketches some of the difficulties that the man in charge of a little gas-works has to face daily; and incidentally—in charge of a 30 million cubic feet works himself—he shows, by relating his experience, that he is the man in the right place at Briton Ferry. There are two suggestions in the paper. One is that gas men should specially meet to discuss topics of common interest which cannot, however discreetly handled, be publicly discussed—taking, in this matter, a leaf out of the books of employers' federations and such-like bodies. Of course, the idea has been largely materialized in the Gas Associations possessing Commercial Sections. The other suggestion is that concentration of the sources of gas manufacture in a district such as that of West Glamorgan, with distribution from town to town by high-pressure, would result in a much cheaper supply. There are eleven gas-works in this area at present. Therefore, before Mr. Mogford's ideal could be achieved, there would have to be a great destruction of Acts of Parliament, a great scrapping of plant, much present productive capital rendered unproductive, and a great capital expenditure on trunk mains that would produce comparatively little return. Theoretically he is right; but practicability does not always keep company with theory. If it were a virgin district, the matter would be an entirely different one; but existing conditions, the cost of conversion and sacrifice, would delay so long the cheaper gas supply that irremedial injury would probably occur meanwhile. There would have to be a very gradual transformation of supply from the central manufacturing station in order to ensure that there was no undue loss. Mr. Mogford has evidently been induced to consider this question of centralization through the introduction into the district of the ill-fated South Wales Electric Supply Company. The fortune of that Company, financially and commercially, has not been encouraging; but there is one lesson that small local authorities should heed from experiences in the district with that Company, and it is that, until an Electric Power Company are well established, too much faith should not be placed on a continuance of their active working life. If there is, it may be that an electrical distribution system may be left on the hands of such small authorities, with no bulk supply forthcoming. The paper brings before us nothing very new technically; but nevertheless it supplies, as has been said, some interesting reading matter.

Retort-House Adaptation to Modern Systems.

PERHAPS the greatest compliment that can be paid to Mr. R. E. Gibson, of Liverpool, in respect of his paper read before the Manchester and District Junior Gas Association on Saturday, is to say that, after reading it, we fail to find that his treatment of the subject of "The Adaptation of Old "Retort-Houses to Modern Methods of Carbonization" is in any way inadequate. For a paper before a technical organization, where the object is to raise discussion as well as to impart information, it was somewhat long, and would have come better, in its present form or with addition, as a serial for the pages of the "JOURNAL." It bristles with so much point that anything short of a protracted study before comment would not be doing justice to the author's work, which will stand as a valuable narrative of actual experience at Liverpool, under Mr. Edward Allen's engineership, in the conversion of old retort-house equipment to the lines of modern and approved practice. Experience of such diverse character can only be obtained in works of the vastness collectively of those at Liverpool; and Mr. Gibson has taken full advantage of the special opportunities that have fallen in his path to accumulate highly valuable information. The most controversial part of the paper, for the advocates of the new systems of carbonizing and retort-house working, will be found under the side heading of "Costs." The new retort-house plant for charging and discharging horizontal retorts has, it is commonly recognized, cut away a large part of the saving in first and labour costs that would otherwise have accrued to the newer processes of carbonization; but what Mr. Gibson shows, in bold figures, will not be universally endorsed. He compares Liverpool initial and working costs per ton of coal carbonized with figures published in the "JOURNAL" in January last by Mr. E. Körting for vertical retort working in Berlin. Circumstances alter cases; but every engineer can only contrast his own working and experience with the most authoritative information available for any other system. That is what Mr. Gibson has done; and he finds that, in first cost, the Berlin verticals work out more expensively than the Liverpool inclined and horizontal settings, but that, in the expense of labour per ton, between the Berlin vertical working and the Liverpool horizontals, charged and discharged by the Fiddes-Aldridge machine, there is an advantage of 0·24d. in favour of the verticals. On the Berlin conditions of vertical, inclined, and horizontal working—conditions that are comparative—Mr. Körting has shown, and will no doubt once again show, that the vertical settings and practice have a complete superiority in the matter of costs. But, it may be repeated, circumstances alter cases, as Mr. Gibson himself confesses, in the passages introducing the section dealing with costs, by saying that "unfortunately reliable comparisons of the various systems "are difficult to obtain, owing to the conditions differing "widely in different places." Those who desire to make critical examination of Mr. Gibson's figures will doubtless wish that he had given more guiding detailed particulars in regard to them.

The Lamp Post the Guide.

STREET lamp-posts have been subjected for all time during their existence to every vilification and indignity, for the general convenience and service, that the wit of man could devise. They have been made to bear tablets denoting the street in which they are located, have been turned into finger-posts, have borne letters and figures informative to the fire brigade, have supported enamelled plates bearing the legal cab fares from their particular location, have even been used as sewer ventilators, have accommodated water-pipes for drinking fountains, have had schemes built about them for providing, by the application of prepayment mechanism, hot-water, confections, fruits, food, cigarettes, matches, and such-like, and have been of late years the perennial butt of the motor bus. As though in this list of service and degradation additional to legitimate function, lamp-posts have not enough to bear, an Oxford Professor—Mr. H. H. Turner—has formulated and promulgated a scheme for imposing some

further duty on them; its intention being to enable wayfarers in London streets, who have a memory for figures and can mentally "do" a little subtraction sum, to know precisely the distance they are from any given place, or to find their way to any desired spot, without any further direction. The street lamp-post, in short, is to be the guide and friend to all in doubt. Professor Turner proposes that each side of the street lanterns should have its own particular point of the compass painted on it—N., E., S., or W.; and on a plate would be inscribed the distance of each post from a given standard point, as well as its direction from that point—the distance marked in miles, tenths, and hundredths.

Take Greenwich as the standard point. A street lantern a distance away bearing on the west face the figures 832 would signify to the initiated 8 miles, three-tenths, and two-hundredths west of Greenwich; or supposing on the north side the figures were 586, these would indicate that Greenwich was 5 miles, eight-tenths, and six-hundredths north of that point. "Suppose now a stranger wished to start from "this particular lamp for some address in London. Instead "of his troubling to identify the street and the house on a "map, all he would need would be the two numbers specify-"ing the spot aimed at—say, 1046 and 1210. He would "know that he must go something over 2 miles west (eight "from ten leaves two) and nearly six miles north (six from "twelve leaves six)." That is the scheme in brief. It may be ingenious; but on that head we need not here express an opinion. As to its utility, however, we are not convinced. Most people would not trouble about what would be to the majority the mystic figures adorning the lamp-posts; and they would go to work to find their way through the maze of London streets "just in the old familiar way." Cheap transit for long distances in London puts Professor Turner's scheme beyond the pale of real utility; and for short distances there is always the accommodating policeman.

The Professor, however, does not tell us how he would deal with round gas lanterns, or those of trilateral form such as the late Sir George Livesey put upon his "Eddystone" pattern lamp-columns in the principal thoroughfares of South London, when years ago, by a stroke of good policy, he managed there to effect arrangements for the conversion of the old flat-flame street lamps to incandescent gas lighting. There are the electric arc lamps, too, hoisted high in the air, and round. What size letters and figures would these require to enable the man in the street to distinguish them? There are the centrally suspended flame arc lamps in the City. A roaring trade would no doubt be done there in hiring telescopes to wayfarers desirous of consulting the lamps. Maybe though, the letters and figures would be shadowed down on the road surface, which, if distressing to drivers and horses, would possibly to a few be a convenience. And yet another difficulty would be the "encircling "gloom" during foggy days. Professor Turner had better reconsider his scheme from the points of view of modern conditions—including tubes and motor buses—and practicability. He may then find both utility and practicability vanish into boundless space.

Cost of the Dublin Strike.

Unusual circumstances have had an adverse effect on the accounts for the first half of the present year of the Alliance and Dublin Consumers' Gas Company; and to pay the dividends recommended by the Board, necessitated the withdrawal of £6424 from the reserve fund. This, of course, is a step which is very frequently taken when, for one reason or another, the profits of a gas company display a temporary shrinkage; and there is nothing in the present instance to call for remark, except the chief cause of the deficiency. The price of coals has, of course, been high; but, as a matter of fact, the amount by which the sum available falls short of that required for the dividend is not much more than half the total loss which it is calculated fell upon the Company through an ill-advised strike that took place on the works just about last Christmas. At the time, some 200 or so of the Company's employees left their jobs in a great hurry—in fact, without any notice at all; and, it being the busiest season of the year, the Company were naturally inconvenienced thereby. The situation was, however, one that had to be faced; and the Directors and officials are to be congratulated on having met it in a manner which is likely to render the undertaking immune from similar trouble for a long time to come. For, be it remarked, great as was the anxiety displayed by these misguided employees to suddenly leave their work, they very shortly afterwards displayed an even more pressing desire to get back to it; and then they found how much more easy it is to get out of a good job than to get into it again. The most elementary Union tactics dictate the carrying out of a strike just when it appears most nearly certain the strikers cannot be done without by their employers. Too frequently, however—from the point of view of the men's leaders—there is some flaw in the calculation; and the strikers learn what all men should know, that they are not indispensable. So it was in Dublin. The Company won a fight which was thrust upon them; and the minimum cost of doing so the Chairman (Alderman W. F. Cotton) puts at £10,000. The sale of gas for the six months showed a falling off of 21½ million cubic feet, as compared with the corresponding period of the previous year; and while the weather and the greater use of incandescent burners were doubtless responsible for some of this shrinkage, the strike left the Company short of gas for weeks during the darkest days of the year. During the time the new retort-house hands were being trained, the production of gas was considerably curtailed—the yield from the coals carbonized on some occasions being, Alderman Cotton states, only about one-half the usual quantity. Then, of course, there was the cost of boarding and lodging the new men on the works; so that altogether the Company could not have hoped to emerge from the struggle without incurring substantial loss. Considering all things, there will be general agreement with the Chairman that the Company came out of the trouble very well; and, after all, in so far as the wholesome lesson the men have learnt may constitute an insurance against future strikes, the money expended cannot be regarded as wasted.

The Census of Production Act.

Section 3 of the Census of Production Act, 1906, makes it obligatory on every person specified in the schedule to the Act (upon receiving from the Board of Trade notice in writing to that effect) to fill up, in a stated time and manner, a "form appropriate to his trade or business." The penalty attaching to refusal or neglect to properly fill up the form, to making a false return, or to declining to answer any question necessary for obtaining the information required to be furnished under the Act, is, for each offence, a fine not exceeding ten pounds, and in the case of a continuing offence a fine not exceeding five pounds for each day during which the offence continues. In respect of false returns and answers, the offence is to be deemed to continue until a true return or answer has been made or given. In accordance with the Act, forms have been prepared by the Board of Trade for distribution in order to secure the information required for the "first census of production of the United Kingdom." They have been drafted by the Director of the Census of Production, in consultation with Special Advisory Committees representative of the industries concerned; and two of them relate to gas and water undertakings. It is pointed out—and this, of course, is an important feature—that all information given in satisfaction of the requirements of the Act will be treated as strictly confidential. Inasmuch as the main object of the Act is to ascertain the total production of the United Kingdom, the particulars that may be furnished in reply to the forms sent out will be used solely in compilation of general statistical results, and no information with respect to any individual establishment or firm will be in any way disclosed. In fact, any person improperly disclosing such information, or publishing information so disclosed, is liable to imprisonment for two years, with or without hard labour, or to a fine, or to both imprisonment and fine. In the form for gas-works there are eleven questions—but, of course, most of them require more than one answer. To seven of the questions, replies are compulsory; but the other four relate to voluntary information. For water-works, there are ten questions—seven compulsory, and the remaining three voluntary.

London and Southern District Junior Gas Association.—The new session of the Association will open on Friday, the 23rd inst., at the Cripplegate Institute, Golden Lane, E.C., at 7.30 p.m., under the presidency of Mr. W. J. Liberty. The principal feature of the evening will be the opening address, which will be delivered by Mr. H. E. Jones, M.Inst.C.E. The meeting will be of a social character, to enable members to become better acquainted with each other.

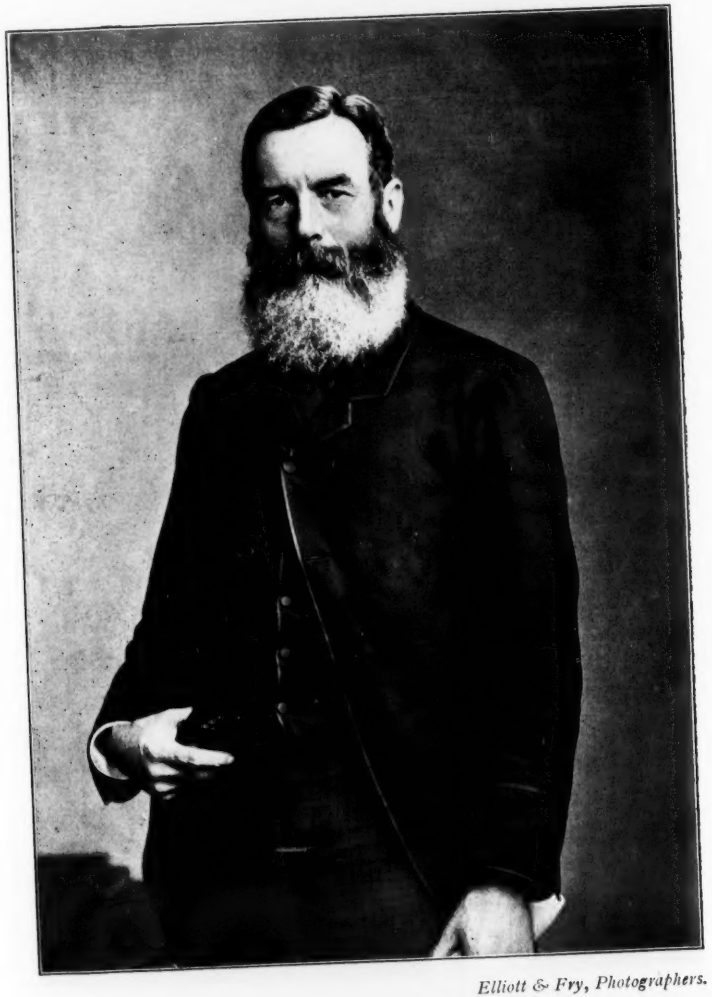
SIR GEORGE LIVESEY.

It is with the most profound regret that we record the death of Sir George Livesey, which took place about nine o'clock last Sunday morning at his residence, "Shagbrook," Reigate. It was mentioned in the "Journal" last week that Sir George was so ill as to be confined to his room, but that, though extremely weak, his condition was not such as to cause immediate alarm among his multitude of friends. Unfortunately, the patient grew worse, and it became a question as to whether an operation would not be necessary. As the result of a consultation, however, it was decided that it could not be performed with any hope of beneficial results. Subsequently, the patient gradually lost strength, and passed quietly away. It will doubtless be remembered that Sir George Livesey was seriously ill just four years ago. What was at first only a slight indisposition developed into something more serious, the course of which was arrested by a successful operation, from which he made a good recovery. By the middle of November, he had progressed so favourably as to enable him to undertake correspondence, and thank, through our columns, the many friends who, by letters and otherwise, had, as he said, "given warm expression to their feelings of friendship and sympathy" during the time he had been laid aside. That sympathy had, he said, greatly cheered him. Early in December the patient was recuperating at Eastbourne; and by the middle of the month he was once more actively engaged with the affairs of the South Metropolitan and the South Suburban Gas Companies, and paid a visit to the Earl's Court Exhibition. Wherever he went, his friends and all who knew him greeted him most cordially; and everybody hoped that his accustomed vigour had been re-established for some years. From that time onwards, nothing occurred to disturb this feeling of confidence till about three weeks ago, when Sir George was about to start upon a holiday. He was then taken so ill as to necessitate the calling in of his medical attendant, who would not allow him to leave home. It was hoped and expected that medical skill and careful nursing would, in a short time, effect restoration to health. This, however, was not to be. To Lady Livesey, who has lately been passing through a time of intense anxiety, we offer our sincere condolence in the great bereavement she has sustained; and, in doing so, we think we may with confidence add the assurance that the entire gas industry will join with us in this expression of sympathy.

George Thomas Livesey was born in Islington on the 8th of April, 1834. His father was Mr. Thomas Livesey, who was at the time in the service of the Gaslight and Coke Company, with whom he had been since 1821. His uncle was for some time Deputy-Governor of the Company. So that the connection of the Livesey family with the supply of gas in London extends back almost to the introduction of this illuminant. In 1839, Mr. Thomas Livesey left the Company to take the position of Secretary and Manager of the South Metropolitan Gas Company, which was incorporated in 1842. He had a residence very close to the Company's premises; and consequently his two sons—George and Frank—literally lived in the atmosphere of gas-works. The former entered the Company's service in 1848, when quite a boy; and he acquired such a knowledge of the details of gas manufacture that he became his father's Assistant. Between 1854 and 1858, an important step was taken by the Company, in conjunction with their neighbours, the Surrey Consumers', the Phœnix, and the London Companies. At the instance of the late Sir John Thwaites, the first Chairman of the Metropolitan Board of Works (who were the predecessors of the London County Council), they divided South London into districts, one of which was allotted to each Company; and their example was followed by those north of the Thames. In this work Mr. Thomas Livesey necessarily took a conspicuous part; and he found a thoroughly reliable helper in his Assistant. In 1862, consequent upon the growth of the Company, it became necessary to separate the technical and official duties discharged by Mr. Thomas Livesey. Mr. George Livesey was accordingly appointed Engineer; his father retaining the positions of Secretary and General Manager. Districting having been successfully carried out, it was not unnatural that the question of amalgamation should soon arise. As the result of a suggestion made by a Parliamentary Committee that there might with advantage be a consolidation of gas undertakings in the Metropolis, the report presented by the Directors of the South Metropolitan Company at the half-yearly meeting in October, 1867, contained a remark that they would not oppose an amalgamation with the Surrey Consumers' and Phœnix Companies. No further step in the matter, however, was taken then. Two years later (in 1869), the Company obtained power to raise £250,000 of additional capital. At the same time, Dr. Letheby was appointed the Chief Gas Examiner for the Metropolis, Mr. Charles H. Parkes the Official Auditor, and Messrs. Patterson, Evans, and Pierce the Metropolitan Gas Referees.

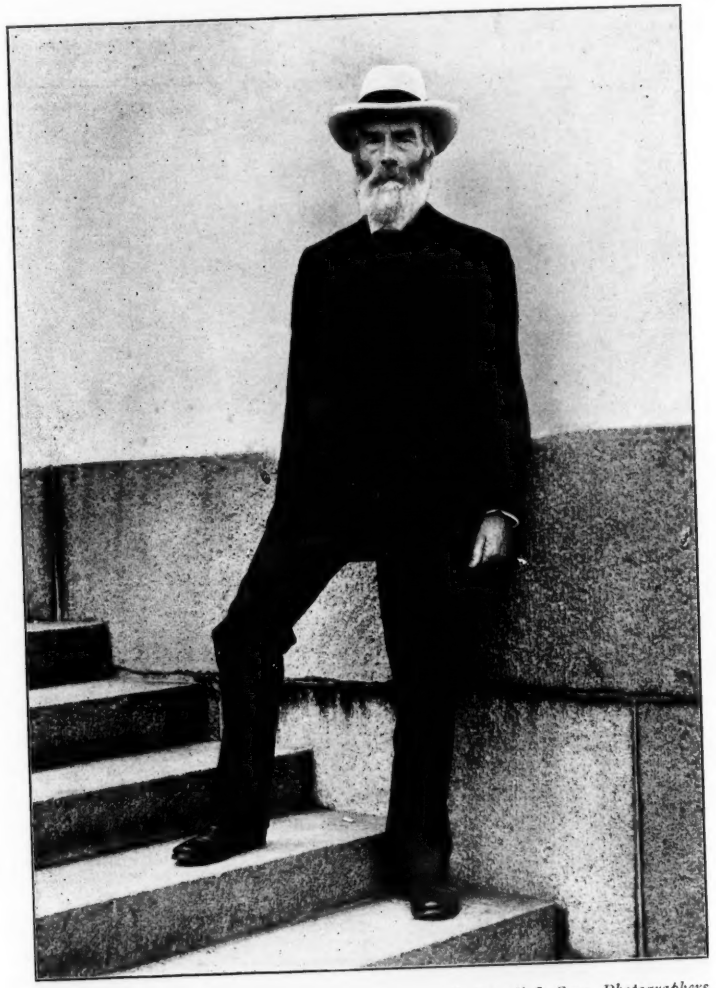
Mr. George Livesey continued to discharge his duties, though his work was not specially acknowledged at the half-yearly meetings of the Company until October, 1870, when Mr. Thomas Livesey, in responding to a vote of thanks passed to him, said credit for the management of the engineering department of the undertaking belonged to his son, who had for some years been Engineer of the Company. This position he occupied until 1871, when, on the death of his father, on the 10th of October, in his 65th year, he was appointed Secretary. He held the two offices until 1882. Under the Scheme of Amalgamation with the Surrey Consumers' and Phœnix Gas Companies, referred to later, provision was made for Mr. Livesey's retirement, and his appointment as Director. At the meeting of the Company in February in that year, he was accordingly elected to a seat at the Board; his brother, Mr. Frank Livesey, succeeding him as Chief Engineer, and Mr. Frank Bush, who had been Assistant to Mr. J. Orwell Phillips at the Gaslight and Coke Company, being appointed Secretary. At the August meeting, Mr. Shand, who had succeeded Captain Heathorn as Chairman of the Company, acknowledged the assistance the new Director had been to the Chief Engineer and the Secretary. Early in 1885, three of the Directors — Messrs. Shand, Finlay, and Butler—resigned their seats on the Board; whereupon Mr. Livesey was elected Chairman.

It may now be of interest to sketch briefly the progress of the Company. As already mentioned, it was incorporated in 1842, and it shared with the three other Companies the gas supply of South London. The growth of the business went steadily on till the close of 1871, when the possibility of much greater expansion presented itself. Acting, as previously stated, upon a suggestion thrown out by a Parliamentary Committee, a special meeting of the shareholders was called to take into consideration the amalgamation of the Company with the Phœnix and Surrey Consumers' Companies. The proposal was agreed to, and a Bill was introduced to obtain legislative sanction for effecting it. Owing, however, to the Committee to whom the Bill was referred imposing terms to which the Directors could not consent, it was withdrawn. The proposal was revived a few years later, under the powers conferred on the Company by their Act of 1876, and was eventually carried out; the amalgamation of the Surrey Consumers' Company dating from Oct. 28, 1879, and that of the Phœnix Company from the 1st of January in the following year. By these amalgamations, the Company's district was extended so as to comprise the whole of South London between Woolwich and Wandsworth, with the exception of small portions of Lambeth and Battersea supplied by the London Company. The expansion did not end here. Negotiations were opened a few years later with the two Companies supplying Woolwich; and a scheme authorizing amalgamation with them was sanctioned in September, 1884. The continually growing business had to be met; and, accordingly, early in 1876 the shareholders



Elliott & Fry, Photographers.

Portrait taken after the South Metropolitan Gas Works Strike in 1889.



J. Russell & Sons, Photographers.

Portrait taken after the Co-Partnership Dinner at the Crystal Palace, May 2, 1906.

SIR GEORGE LIVESEY, Born April 8, 1834; Died October 4, 1908.

were called together to give authority for the promotion of a Bill to confer further capital and other powers upon the Company. This was duly passed, and it gave the Company a standard price of 3s. 6d. with the "sliding-scale," which Mr. Livesey had suggested, and which he had been instrumental in introducing into an Act obtained by the Commercial Company in the preceding year. Contemporaneously with the South Metropolitan Company, the Gaslight and Coke Company had the principle embodied in an Act, and since then it has been generally adopted by gas companies. Under Mr. Livesey's supervision, the plant of the Company was not only kept in a condition to meet adequately all the demands upon it, but was extended in several ways, which will be more fully dealt with when his improvements in gas apparatus are noticed.

Notwithstanding all the extensions of plant which Mr. Livesey had carried out, it became apparent to the Directors that the time had come for transferring the manufacturing operations of the Company to an entirely new site. Accordingly, on March 19, 1880, a meeting of shareholders was called to sanction the promotion of a Bill to authorize the purchase of additional lands. This was done, and in the following November the usual notice was given for a Bill to enable the Company to acquire 140 acres of land at Blackwall Point. This was the initial step in the direction of carrying out the scheme for the Company's extensive station at East Greenwich. The Bill was introduced in due course; and it is scarcely necessary to say it met with strenuous opposition from the Metropolitan Board of Works, who objected to the Company's proposal to continue the standard price of 3s. 6d. fixed by their Act of 1876. The Board's opposition was, however, ineffectual; the Select Committee deciding that the standard should be maintained. The Bill received the Royal Assent on Aug. 11, 1881. It empowered the Company to purchase 120 acres of land, and raise share and loan capital to the amount of £1,050,000. No time was lost in exercising the new powers acquired; and at the half-yearly meeting in August, 1883, the Directors reported that satisfactory progress had been made with the purchase of land at East Greenwich. Six months later—in February, 1884—the new works, which have been fully described in our columns, had been commenced; contracts having been entered into for two gasholder tanks 250 feet in diameter and 60 feet deep, a retort-house capable of producing 5 million cubic feet of gas per day, and 4 miles of 48-inch mains. At the August meeting the Directors were able to report that the new works would be ready for making gas by the winter of 1885-6. Another six months saw the retort-house and coal-store finished, the jetty well in hand, the river wall in progress, and 3 miles of main laid. As it was found that the old works of the Company were adequate to supply the demand for gas, the opening of the new ones was postponed. At the half-yearly meeting in August, 1886, however, it was reported that they would be ready by the following winter; and in due course they were brought into use. It will probably be remembered that the scheme provided for the construction of the works in complete sections, so that additions could be made as required.

While these works were in progress, the Company passed through some eventful times. Though so recently in Parliament with their big Bill, they had to go to Westminster again—this time for authority to increase their borrowing powers in respect of the original capital. The Bill went safely through both Houses, and received the Royal Assent on the 19th of June, 1882. In the succeeding five years, Amalgamation Schemes were conspicuous features in the Company's history. First, and possibly the most important, was the proposal, in 1883, for a union of the South Metropolitan and Gaslight and Coke Companies; certain complications having arisen in connection with the district supplied by the London Gas Company, part of which was on the south side of the river. The shareholders of the South Metropolitan Company approved of the scheme; but, after being for some time under consideration, the Board of Trade, on Jan. 14, 1884, refused to sanction it. The Company were more successful with their neighbours in the east—the two Woolwich Companies—which became merged in the larger undertaking on Jan. 1, 1885. Two years later, a similar proposition was made to the Crystal Palace District Gas Company, the chairmanship of which was then held by the late Mr. Henry Palfrey Stephenson; but it was not entertained. Time and circumstances, however, conspired to bring the undertaking under the influence of the powerful mind which controlled the destinies of its more important neighbour. Meanwhile, in the midst of amalgamations and rumours thereof, the Company found themselves in trouble with the Gaslight and Coke Company with regard to the supply of gas to the Nine Elms station, which the northern Company contended was an invasion of their district—a contention which they successfully sustained in the Courts. This gave rise to what, in diplomatic language, would be called "strained relations" between the Chairman of one Company and the Secretary and General Manager of the other; and it was not until the relinquishment of office by the latter that a more friendly feeling prevailed. Another trouble which overtook the Company was a serious explosion at Rotherhithe, which involved them in heavy damages.

Notwithstanding these and other drawbacks, the Company never swerved from the policy laid down emphatically by the Chairman, that to ensure the prosperity of the concern the interests of the consumers must be studied, by cheapening the commodity sold. The price of gas at the commencement of 1872 was 3s. per 1000 cubic feet. It was afterwards reduced to 2s. 10d.; and on Jan. 1, 1884, it was brought down to 2s. 8d. Two years later another 2d. was taken off; and early in the following year 1d. more—bringing down the figure to 2s. 5d. The effect of this low charge was an increase of 5¾ per cent. in the business in the second half of 1888, compared with the corresponding period of 1887. This price remained in force till Christmas, 1888, when it was reduced to 2s. 3d. Three years later it was necessary to raise it to 2s. 6d.; but by Michaelmas, 1895, it was down again to the former figure, at which it remained till the end of 1898. Two reductions, each of 1d., were made in the following year; but at Lady Day, 1900, the price had to be raised to 2s. 4d., and at Midsummer to 2s. 8d., owing to the increased cost of coal. It is interesting to record, in connection with these increases, that though the Directors sent out to the consumers no less than 200,000 circulars to explain the circumstances which had necessitated their action, only 28 letters were received in reply; and in most cases the writers objected to the method of giving the notice rather than to the increase itself. A more striking proof of the confidence of the consumers in the Company and its Chairman could scarcely have been given. That this confidence was not misplaced was demonstrated in the summer of 1901, when the price was lowered by 5d. In the report presented at the half-yearly meeting early next year, it was explained that 2d. of this amount was due to the reduction of the standard illuminating power of the Company's gas from 16 to 14 candles; the rest being attributable presumably to a cheapening of coals. The price of 2s. 3d. continued in force till the end of 1903. In the report presented at the half-yearly meeting in the following February, the Directors made the gratifying statement that the accounts were sufficiently satisfactory to justify a reduction of 2d. per 1000 cubic feet. This, on the quantity of gas sold in the year, meant no less than £96,000, which was the measure of the benefit the consumers obtained by the concession. It was followed at Midsummer by a further drop of 1d.; bringing the price to an even 2s. At this it remained till Midsummer last year, when, owing to the advance in coal, it had to be raised to 2s. 3d., at which it now stands. It may be added that the Company went with the times and adopted the penny-in-the-slot system of gas supply; and that they induced the Local Authorities to have incandescent gas for the public lighting. In view of the greatly increased demand for gas-mantles both for this and interior illumination, Sir George Livesey's attention was directed to the possibility of a failure of the supply of the raw material; and the result was the purchase by the Company, three years ago, for about £19,000, of a monazite sand property in the Carolinas.

The year 1889 was a memorable one in the history of the Company and in the career of its Chairman. In the course of the summer, there had been an agitation among the gas stokers of London, with respect to their pay and hours of work; and on the 19th of June some delegates from the retort-house gangs from the different stations of the Company had an interview with the Directors on the subject. The men laid before them a number of grievances, many of which were of a trivial nature, in addition to their claims for less work and more pay. The outcome of the interview was the issue by the Board of an *ultimatum* to the effect that the pay of the various grades of retort-house men would be increased by 8d. per day, with allowances, if the twelve-hour shifts were retained. If, however, the men preferred to work eight-hour shifts, the Directors would not raise any objection, but the pay would be after the then existing

rates, though the work would be reduced from 96 to 80 mouthpieces for a three-handed gang. The kindly way in which the Chairman, Directors, and Engineers of the Company talked with the men at the interview produced a good impression; and they promptly made up their minds, without taking counsel from any outside agitators, to accept the Board's offer of an eight-hour shift at current wages. The new system was started at all the stations on the 7th of July. At a meeting of gas stokers held at Lower Sydenham on that day, a resolution was passed thanking the Directors and Engineers for their concession. Notwithstanding the labour agitation that was going on at the time, things seemed to have been settled at the South Metropolitan Gas-Works. In order to bring into closer union the workmen and their employers, the Chairman, in a letter which appeared in our columns on Nov. 12, 1889, set forth a scheme of profit-sharing which had been unanimously adopted by the Board on the previous Wednesday, and accepted by between 600 and 700 of the men. The condition of participation in the scheme was the signing of an agreement to serve the Company for a period of twelve months at one or other of their stations. A large meeting was held at Deptford to discuss the proposed scheme; and the General Secretary of the National Union of Gas Workers (Mr. William Thorne) urged the men not to sign the agreement. This course was unanimously resolved upon, so far as the members of the Union were concerned. The decision was followed by an *ultimatum* from the President and Executive of the Union to the Directors of the Company, demanding the immediate withdrawal of the profit-sharing arrangement, and the dismissal of the men who had accepted it. The Board unanimously rejected the demand, and prepared for the worst. The result was, as many of our readers will remember, the sending in of notices by about 1800 members of the Union to terminate their engagements at the expiration of seven days—dating from the 6th of December. Measures were promptly taken to supply the places of the disaffected men; and a large number of letters containing offers of assistance were received. To afford protection, the police authorities expressed their readiness to act at a moment's notice, and stated that any force required would be forthcoming. The strikers, on the other hand, were encouraged by promised help from a prominent labour agitator who has since been raised to the far more lucrative position of a Cabinet Minister. It is unnecessary to refer now to the details of this great strike, which were fully recorded in our columns at the time. It is sufficient to recognize the masterly way in which all the difficulties were overcome by the determination of the Chairman, who was ably supported by the Directors, by his brother (the then Chief Engineer), by the engineering staff, and by the men who remained loyal to the Company. Men were found to take the places of those who, at the dictates of their Union, had thrown up their employment; and, to ensure their freedom from molestation, they were lodged upon the works. Of course, the public were put to a certain amount of inconvenience, as the strike occurred at the busiest time in the year. But, considering its magnitude, there was not very much cause for complaint, though an attempt was made to get up a case against the Company. As a matter of fact, the Company and the Union were engaged in a contest as to who were to be masters in the works; and the Company were the victors. The Chairman, however, ran the risk of losing his life; for at a mass meeting in Hyde Park an infuriated compositor named Weir incited the mob to murder him. Weir was tried before Mr. Justice Hawkins at the Central Criminal Court; and, having expressed his deep regret at using the intemperate language with which he had been charged, he was liberated on entering into his own recognizances in £100 to keep the peace, and to come up for judgment if called upon.

The circumstances attending this terrible crisis were fully set forth in the report presented by the Directors at the half-yearly meeting in February, 1890, when the Chairman supplemented the details by a most able speech. On that occasion, Sir W. H. Wyatt proposed a resolution—

> **That the sincere and hearty thanks of the proprietors be tendered to the Chairman (George Livesey, Esq.), and to the Directors of the South Metropolitan Gas Company, for the energy, courage, and skill they displayed, under circumstances of great and unusual difficulty, in successfully meeting the recent strike of the entire body of the Company's stokers. By their firm action they saved, although necessarily at great cost, the property of the Company and the lighting of South London; and by their example they rendered very great service to other companies and traders employing labour generally.**

In speaking to this resolution, Sir William said that if the Board had not acted as they had done, the proprietors would not have a dividend such as the one proposed in the report. Moreover, the men themselves had a great deal to thank the Directors for, inasmuch as they had preserved them from slavery of the worst character. Of course, he added, it had been Mr. Livesey's lot, as Chairman of the Board, to take the most active part in the fight; but his efforts would have been rendered futile had he not been firmly and well supported by his Board. This remark evoked a spontaneous "Hear, hear," from the Chairman. The motion, it is scarcely necessary to say, was carried unanimously. Sir W. H. Wyatt then proposed a further resolution for the formation of a Committee to consider how the "debt of gratitude" due from the proprietors to the Chairman could be best recorded in some formal and lasting testimonial. In supporting the motion, the late Mr. W. Woodall, M.P., expressed the opinion that the workmen had suffered a great wrong owing to the inexperience and unskilfulness of the irresponsible men who had undertaken their leadership. He said the course taken by the Chairman and Directors would eventually be found to have been the best, "not only for their own and other companies' interests, but for those of labour generally." The words were prophetic. The Chairman warmly acknowledged the resolutions, and assured the proprietors that it had been the object and constant aim of the Directors, in the struggle, to do what was right to all parties—the stokers, the officers, the loyal men, the gas consumers, and the public generally. He proposed a vote of thanks to the officers, whose services he eulogized. Mr. George Howlett, in seconding the motion, remarked that, having been in contact with both the engineering and secretarial staffs during the strike, he had been astonished at the quantity of hard, difficult, and anxious work they had got through. Upon the Chief Engineer especially had fallen an immense amount of labour. Mr. Frank Livesey was naturally a quiet man; but during the struggle he displayed such pluck, determination, and administrative skill as would never be forgotten by the officers who looked upon him as their chief. The motion, like the others, was unanimously carried.

A few weeks later, the Chairman and Directors were presented with an illuminated address by the workmen employed at the Vauxhall and Kennington Lane stations, in testimony of their heartfelt and sincere thanks for the successful issue to which they had brought a struggle that at one time threatened seriously to "interfere with their welfare, their happiness, and their livelihood." The testimonial was signed, on behalf of both the old and new hands, by William David Hunter, the foreman. The presentation was made by Mr. Charles Carpenter, who was at that time Engineer of the Vauxhall station, and who had himself been the recipient of a testimonial, in the shape of a silver-mounted dressing-bag, from the "loyal men of the Vauxhall works, in grateful remembrance and appreciation of his fidelity and kindness." In acknowledging it, the Chairman referred to the relations of employers and employed, and expressed the opinion that "if masters and men were to look upon each others as enemies, he was afraid there was a very bad outlook for England." He was convinced that "the only way this great country could maintain the high position to which it had attained was by the employers and employed working closely together." How consistent was the speaker, all through the rest of his life, in the reiteration of this conviction; and how he strove, with all the might of his powerful nature, to bring about the close union to which he alluded. It may be of interest to record here that Mr. Frank Livesey received from the engineering staff a handsome silver salver, as a record of their feelings of respect and loyalty towards him as their chief, their admiration of his professional ability and administrative capacity, and their grateful sense of the uniform courtesy, kindness, and consideration which marked his dealing with them both before and during the crisis through which the Company had passed; that Mr. J. Tysoe, the Engineer and Superintendent of the East Greenwich station, was presented by the workmen with a gold watch, as a token of their regard and esteem; and that the men at his station and at Bankside presented addresses to the Chairman and Directors.

Meanwhile, Sir W. H. Wyatt's proposition for a testimonial did not remain in abeyance. A Committee was

formed, with Mr. (now Sir John) Aird, Mr. H. Butler, Mr. R. Foster, Mr. J. Joicey, and Mr. W. Woodall as members, Sir William as Chairman, Mr. Foster as Treasurer, and Mr. A. G. Hounsham as Secretary, to carry it into effect. Subscriptions having been invited, a meeting of the Committee was held in the spring of 1890, at which it was stated that Mr. Livesey wished the money collected to be "appropriated in the manner that would result in the greatest permanent good to the poor of South London;" and he suggested a recreation-ground. The Committee, however, recommended —"That an illuminated address be presented to the Chairman and Board of Directors of the South Metropolitan Gas Company, to be hung in their Board-room; and that the balance of the fund be handed to Mr. Livesey;" and this was agreed to. The outcome of the labours of the Committee was the presentation to the Chairman, at the close of the half-yearly meeting of shareholders on Aug. 20, 1890, of his portrait in oils by Mr. W. M. Palin, accompanied by a cheque for £1700, and to the Chairman and Directors collectively an illuminated address. In making the presentation, Sir W. H. Wyatt stated that for a long time Mr. Livesey said he would not accept any personal present; but the subscribers at last rather "forced his hand," and told him that he must have a portrait of himself, which it was hoped the Directors would hang in their Board-room. Mrs. Livesey would also be asked to accept a copy of the portrait. In acknowledging the gift, the Chairman expressed his pleasure at this proposal. He said the past year had been an exceedingly trying one to his wife, whose anxiety had, he thought, been worse than his own work. It may be convenient to mention here that the balance of the testimonial fund amounted, with interest, to £1822; and it was employed, as the recipient wished, in conjunction with money contributed from other sources, in the provision of a recreation-ground on Telegraph Hill, Hatcham. He also gave a drinking fountain. The ground was opened on April 6, 1895, by Mr. Arthur Arnold, the Chairman of the London County Council, who congratulated Mr. Livesey on the munificent thought that led him to the conclusion he had come to. He had more than doubled the value of his testimonial by the noble and magnanimous use to which he had applied the money.

In view of their successful triumph over the Gas Workers' Union, the Company determined not to employ any more members of this body. An important alteration was made in the agreement signed by the men, by the withdrawal of the "strike clause;" thereby making the bonus-money the absolute property of the men, subject to the terms and conditions set forth in the document. On July 26, 1890, a mass meeting was held on the Cricket Ground at the Old Kent Road station to consider the bonus scheme. Before the arrival of the Chairman and chief officers, who had been invited to attend, the following resolution was carried with great applause:—

> **We, the employees of the South Metropolitan Gas Company, unanimously desire to present our most hearty thanks to the Chairman and Directors of the Company for the very liberal and satisfactory way in which they have conceded the whole of the profit-sharing scheme. We also desire to thank them for the very courteous manner in which they have received us on all occasions; and hope that the friendship that now exists may long continue—adding to the prosperity both of the Company and its employees. We wish long life to your honourable Board.**

The bonus scheme had now taken definite shape. A set of rules, approved by Mr. Mark Knowles, had been framed to govern it; and, in a circular-letter addressed to the workmen, Mr. Livesey offered a few remarks on the scheme, and urged upon the men the advisability of saving money. This advice he emphasized in a characteristic speech at the mass meeting. There was another pleasant gathering in the same place on Sept. 20, when beautifully illuminated albums, subscribed for by the men and their wives, were presented to Mrs. George Livesey, Mrs. Frank Livesey, Mrs. Bush, and the Directors. From these beginnings, the Company's profit-sharing scheme has attained the proportions with which our readers are familiar. It has developed into co-partnership and the establishment of a "Co-Partnership Journal;" and holders of its funds are represented upon the Board of the Company. Employers and employed are in co-operation; and the ideal of the Chairman has been realized. This is manifest at the gatherings of Directors and workmen which have been held annually since the one above referred to. At the half-yearly meeting of the Company on Aug. 10, 1898, Mr. Livesey told the proprietors that he had just completed fifty years' connection with them; and he said he recognized the triumph of his new labour policy as the crown of this long service. In the summer of that year, the breakfast time of all men except those engaged in the retort-houses was increased to three-quarters of an hour, without reduction of pay; and the example set by the Company was followed by their neighbours the Crystal Palace District Gas Company. In October, the stokers' wages were increased 5d. a day; making 6s. a day for the eight-hour shift. We may leave this subject with the simple statement that at the end of last year the effect of the happy relations—the peace and goodwill —existing in the Company was well shown on the Christmas card sent out by the Directors, which set forth that the 5003 co-partners then held £217,360 of the Company's stock, of the market value of £260,832; that they had on deposit at interest £58,295; and that they had invested in the purchase of their houses £28,600—making a grand total of £347,727. This was equal to £69 10s. for each co-partner; or, excluding the officers, £50 per man. What would they have had under the Gas Workers' Union?

It will now be appropriate to glance at the engineering work devised and carried out under the supervision of the late Chairman of the Company; and our purview will probably be sufficiently retrospective if we merely go back to the autumn of 1880. At that time many important extensions and improvements had been carried out in the plant and apparatus at the Old Kent Road station by Mr. Livesey, assisted by his brother and Mr. John Somerville; and they were described in a series of articles which appeared in our columns at the time. The subjects dealt with traversed nearly the entire range of practical gas manufacture; and formed a fair epitome of the then most modern development of gas engineering as applied in a representative Metropolitan works. A conspicuous feature of these extensions was a three-lift gasholder in a concrete tank, in which much interest was taken by the profession generally. The tank as designed was 216 feet in diameter and 53 ft. 6 in. in working depth; but it was subsequently found possible to increase both the diameter and the depth by 2 feet. The inner lift of the holder was 208 feet in diameter and 53 ft. 6 in. deep; the middle lift, 211 feet in diameter and 53 ft. 3 in. deep; and the outer lift, 214 feet in diameter and 53 feet deep. In this holder its designer embodied for the first time in this country the English and French systems of guide-rollers; the guide-carriages on the top of each lift being fitted with one radial roller on the former, and two tangential rollers on the latter system. It was claimed that by this combination the stress resulting from the wind pressure would be distributed on three-fourths of the standards, of which there were 24, instead of on about one-fourth of the number—the holder being well supported without any tendency to distortion of the guide-framing. There were, naturally, some misgivings in certain quarters as to the safety of the structure under heavy wind pressure; but the strains had been calculated by the late Sir Benjamin Baker, and they showed an ample margin of stability. The holder, the capacity of which is 5½ million feet, has withstood many gales, and still towers high above its neighbours in the Old Kent Road.

Early in 1891, the Company invited tenders for the construction of a six-lift gasholder, capable of holding 12 million cubic feet, at the East Greenwich station. In response to the invitation, eleven tenders were sent in, ranging from £41,195 to £54,000. The contract was placed with Messrs. Clayton, Son, and Co., Limited, of Leeds, who submitted the lowest tender; and they undertook to complete the work by Oct. 1, 1892. The cost of the holder worked out to less than £3 10s., and that of the tank and holder together to not much more than £4 10s., per 1000 cubic feet capacity. A great desire being manifest to know how the work could be carried out for the money, Mr. Frank Livesey furnished a number of interesting particulars to our columns; and at the meeting of the Incorporated Institution of Gas Engineers he read a paper on the subject. In the "JOURNAL" for Nov. 22, 1892, we were able to announce the satisfactory completion of this great holder, a feature of which is that two of the six shallow lifts rise above the guide-framing. Another experiment in the construction of partially guided holders was successfully carried out at the Rotherhithe station of the Company in the summer of 1888, when, on the 25th of July, a three-lift gasholder, of which the guide-framing extended to the height of the second or intermediate lift only, was for the first time inflated to its full height; and a problem which had been discussed in our columns in a

series of articles upon the stability of gasholders thereby received its first practical solution. In the summer of 1897, we gave some particulars of an interesting operation in gasholder construction then in progress at the Old Kent Road works. It consisted in the hanging up of a 180-feet gasholder, with the untrussed crown inverted, while the construction of a new additional inner lift was being proceeded with. The work was carried out under the supervision of the Chairman and the Chief Engineer.

In September, 1892, trial settings of eight beds of inclined retorts at the Greenwich station were considered to justify the erection of a further fourteen beds on the same lines. Early in 1894, Sir William Arrol and Co. completed at the East Greenwich station of the Company four of their charging-machines—a similar number of drawing-machines having worked satisfactorily there for two years. This machinery allowed of the charging and drawing of 60 retorts within 45 minutes. A few months later, an order was placed with West's Gas Improvement Company, Limited, for the supply of a complete set of stoking machinery for the Old Kent Road works, and another for a set for the Vauxhall works. Further extensions of stoking machinery have been carried out as time has gone on. In the autumn of 1890, one of the most important contracts for sulphate of ammonia plant ever given out in this country was placed with Mr. Henry Simon, of Manchester, by the Company. It was to be capable of dealing with any quantity of liquor up to 30,000 gallons per day. The plant was completed about a twelvemonth after. The Company subsequently went largely into the manufacture of products, and acquired first the works of Messrs. F. C. Hills and Co., and afterwards (rather more than five years ago) those of Messrs. Forbes, Abbott, and Lennard, adjacent to their East Greenwich station. In 1899, the Chairman lost his brother, who was succeeded by Mr. Charles Carpenter as Chief Engineer. Under his supervision, with the sanction of the Chairman, some interesting trials of American coal were made in the summer of 1900, the results of which he communicated to our columns later in the year. More recent engineering work will be fresh in the recollection of our readers.

In a previous paragraph, reference was made to the reduction of 2d. per 1000 cubic feet the Company were able to make in the price of gas as the result of the lowering by Parliament of the standard illuminating power from 16 to 14 candles. This was the realization of one of the Chairman's ideals. The subject of gas-testing in the Metropolis had for years engaged his attention. Towards the close of 1888, the Company addressed a letter to the Metropolitan Board of Works, expressing the opinion that the standard candle used for testing gas was of a very uncertain character, and that it was desirable to obtain parliamentary sanction for the adoption of a "new and reliable standard," and asking the Board to receive a deputation on the subject. At the meeting of the Board on the 21st of December, the Special Purposes Committee submitted a report asking for authority to approach the Board of Trade to urge the early introduction into Parliament of a Bill to provide for the adoption of a "new and reliable standard of illuminating power, and for the prescription of a standard photometer, with a view to securing uniformity of result in the testing of gas in the Metropolis." In moving the adoption of the report, the Chairman of the Committee (Mr. J. Abbott) stated that a deputation from the South Metropolitan Gas Company had attended a meeting of the Committee and put the matter before them, with the result that they were convinced the time had arrived to go to the Board of Trade with a view to their bringing in a Bill to prevent the sperm candle being any longer used for testing gas. The report was adopted. Early next year, the Company were fined, at the instance of the Board, four half-sovereigns, together with 8s. costs, for deficiencies in illuminating power; and the matter drew from the Chairman some trenchant remarks at the next half-yearly meeting of shareholders. On the same occasion, he stated that he had, by request, attended at the Board of Trade, and been informed by the Secretary that the Board were quite ready to introduce a Bill to put gas testing on a satisfactory basis. In the summer of 1889, the new London County Council (the successors of the defunct Metropolitan Board of Works) addressed a letter to the Board of Trade, and urged them to take steps to provide, by the introduction of a Bill in Parliament, a trustworthy standard of light, prescribe a standard photometer, and give legal force to tests made with a portable photometer. In the summer of 1891, the Company were again convicted for supplying gas of deficient illuminating power; but in the previous April Mr. Livesey had addressed a long letter to the County Council on the subject of gas testing.

The outcome of all these proceedings and correspondence was the decision of the Board of Trade, towards the close of the year, to appoint a Technical Committee, the expenses of which the South Metropolitan Gas Company (whose Chairman was a member of a Committee who dealt with the question ten years previously) undertook to bear. The first meeting was held on Jan. 15, 1892, under the presidency of Dr. Odling, who with Dr. W. J. Russell, of St. Bartholomew's Hospital, represented the Board of Trade. The other members were the three Metropolitan Gas Referees (Dr. Pole, Professor A. G. Vernon Harcourt, and the successor to Professor Tyndall, when appointed); Mr. George Livesey, Mr. G. C. Trewby, and Mr. H. E. Jones, representing the Gas Companies; Mr. G. Rose-Innes, the Corporation of London; and Mr. W. J. Dibdin and Dr. Edward Frankland, nominated by the County Council—Professor Vivian B. Lewes being appointed Secretary. By the summer of 1894 the Committee were able to agree on the substance of their report; and this was presented to both Houses of Parliament early in May, 1895. The Committee condemned the parliamentary candle, and stated that Mr. Harcourt's one-candle pentane standard answered the initial requirement of an unvarying, readily producible equivalent. They found that, for practical use in gas testing, the Dibdin ten-candle pentane argand was the best available standard; and they accordingly recommended its sealing and issue as the authorized and prescribed standard "for official use in testing the illuminating power of the gas supplied by the London Gas Companies." At the spring meeting of the Institution of Gas Engineers, Professor Lewes read a most interesting paper on the work of the Committee. Before leaving this subject, it should be recorded that, in the summer of 1894, Mr. W. J. Dibdin, who was Chemist and Superintending Gas Examiner to the London County Council, presented to that body three important reports dealing with the price, enrichment, and testing of gas in the Metropolis, which were promptly replied to, on behalf of the South Metropolitan Gas Company, by Mr. Frank Bush, the Secretary, who has now, it may be remembered, been placed on the Board. In the summer of the same year, the Company carried out, with the consent of the Council, an experiment of sending out gas without enrichment; and although there was a reduction of the nominal illuminating power of the gas to the extent of a candle or a candle-and-a-half, the consumers were unaware of it. Indeed, in the fortnight over which the experiment extended, their complaints of "bad gas" were fewer than usual. This was the beginning of the crusade for low-grade gas. The subject of gas testing was revived again in 1896, when Mr. Dibdin read a paper before the Gas Institute on "A Standard Photometer," which resulted in sharp passages of arms in our "Correspondence" columns between the author and Mr. Livesey. In November, 1899, the Company gave notice of a Bill to enable them to "establish a variable standard price dependent on a variation in the illuminating power, with an increase or decrease of dividend dependent on the decrease or increase of the price of gas supplied, and of the illuminating power thereof." The Bill as passed lowered the illuminating power as from July 1, 1901, to 15 candles, with a standard of 3s. 2d.; and from July 1, 1905, to 14 candles, with a standard of 3s. 1d. As bearing upon the quality of gas, brief reference may be made here to the introduction of the Carpenter test-burner, and to the removal of the sulphur restrictions, which marked the achievement of another object which had occupied the attention of the ever-vigilant Chairman of the South Metropolitan Company.

Passing for a moment from the affairs of the Company, it may be convenient to refer here to an event in which Mr. Livesey figured conspicuously, and which, while resulting in much benefit to the gas industry generally, unfortunately led to considerable strife and contention in the ranks of those engaged in it, and ultimately to disunion. We refer, of course, to the Electric and Gas Exhibition at the Crystal Palace. In the summer of 1882, it was decided by the Directors of the Palace Company to hold an International Electric and Gas Exhibition, as a sequel to an electric light exhibition held the previous winter. The leading manufacturers of gas apparatus, both in this country and on the Continent, together with the gas companies and the leading gas engineers, were communicated with; a guarantee fund was started, to which the South Metropolitan Gas Company contributed a sum of £500; and an Executive

Committee was formed, consisting of Messrs. George Livesey, Magnus Ohren, and Charles Gandon, with Mr. W. H. Bennett as Secretary. A sum of about £5600 was collected; and the exhibition was opened by the Lord Mayor in state on Wednesday, Dec. 13, 1882, and remained open till the end of the following April. Well-intentioned as the project was, and hard as the General Committee for the Gas Section and the Executive Committee worked to ensure its success, a great deal of ill-feeling was engendered, and accusations of injustice were freely brought. The prominent actors in this unpleasant spectacle have now passed to their rest, and therefore the details need not be gone into here. It is only just, however, to place on record the gratifying statement that, after some years of estrangement, misunderstandings were explained away, and friendship gave place to the far different feeling which—on one side, at all events—had prevailed. In the "JOURNAL" for July 26, 1898, we had the pleasure and satisfaction of announcing that the long-standing disagreement between Mr. Livesey and Mr. Bray had been "honourably and happily terminated." Both were glad to let bygones be bygones, and "recognize each other as friends."

The unhappy difference just alluded to led, as already mentioned, to a number of the members of the Gas Institute withdrawing from that body on the memorable "trader" question, and forming a separate Institution of their own; Mr. Livesey being a member. The first President was Mr. G. C. Trewby; and the first general meeting was held on May 12, 1891. The Institution did good work side by side with the older body till six years ago, when it ceased to exist. Old differences had been removed, and there was a manifest desire for a united body to represent the technical side of the gas industry. That body now exists in the present Institution of Gas Engineers. A pleasant feature of the first meeting of this body, in June, 1903, was the announcement that Mr. George Bray and Sir (as he had now become) George Livesey had been nominated by the Council as honorary members. The nominations having been accepted, Sir George expressed his thanks for what he regarded as the "greatest honour which could be conferred on any man." He added that he must say a word or two about Mr. Bray, but for whom the union of the two bodies could not possibly have taken place. They were very much indebted to him for the great magnanimity he displayed when he told the Gas Institute that he was willing to retire if he was an obstacle to union. So far as Mr. Bray was concerned, the union might have been effected years before; and in electing him as an honorary member the Institution had done what was right and proper. The commercial side of the gas industry is now represented by the Society of British Gas Industries, at the head of which was the subject of this notice at the time of his removal by death. His acceptance of the presidency afforded proof of his willingness to recognize the manufacturers' claims to be considered as members of a large body of technicians all engaged in various ways in furthering the great business of the supply of gas.

We now come to an event in Mr. Livesey's life which will always stand out conspicuously. We refer to his knighthood in 1902. The announcement of the King's intention to bestow this dignity upon one who was the recognized chief of the gas profession was made on the day which, but for His Majesty's sudden illness, would have witnessed his coronation; and it caused very considerable gratification among the recipient's professional colleagues. Referring to the matter at the time, in the "JOURNAL," we used words which we venture to think were then fully justified, and which have not since lost one iota of their truth. It may be permissible to repeat them at the present juncture:—

> **This mark of the King's regard crowns with mundane glory an active working life founded and embedded in honour, and the superstructure of which is framed by self-sacrifice and built in with solid and useful service which has advanced in prosperity and strengthened in endurance a great industry. Mr. Livesey's working life has been entirely spent in and for the gas industry; and it has, in measure great or small, carried benefits, in its time, to all men who have come in contact with the industry at any of the many points of its requirements and products, and will continue to do so. Making at the time of writing a mental retrospect of his work, one fails to find a part in which does not run a vein of powerful influence. In constructive and engineering work, and in administration in all its phases—from productive economy on the works, the treatment of all labouring with him as joint workers and men having identical interests, to purchasing and selling outside the works—his talents, skill, and experience have been brought to bear, ofttimes with a boldness which has excited surprise among many, and has, we venture to say, occasioned him no little anxiety as to the issue. But few men, it may be confidently asserted, have had less disappointment in the accomplishment of beneficent purposes, which is a tribute to his foresight, power of reasoning and inception, and continence in the pursuit of his object. But above all we, and all who intimately know him, hold dear those altruistic instincts which have ever governed his actions, impulsive or considered. . . . In honouring Mr. Livesey, His Majesty has conferred dignity upon the whole gas profession. Mr. Livesey's transparent character, one of the traits of which is his utter dislike of ostentation, permits us to say that he will wear his new title with as little personal regard as he has shown in occupying the eminent position which he attained long years since. The man we have known in the past will be the man we shall know in the future. The same work for the gas industry, and the same consideration for its welfare and all identified with it, will be given by Sir George Livesey with the same singleness of purpose, liberal-heartedness, and courage as heretofore, so long as it shall please the Giver of all blessings to endow him with the necessary health and strength. We hope that Sir George will live many years to bear his new and distinguished title.**

Alas! That hope has not been realized.

Brief reference may now be made to Sir George's connection with other gas companies than the one with which his name will always be first associated. He was a Director of the Crystal Palace District (now South Suburban) Gas Company; and in 1894 held the position of Deputy-Chairman. The profit-sharing scheme had been started at a time when the Chairman (Mr. F. L. Linging) was contemplating retirement on the ground that his age and general health were unequal to the demands of the office. As the changed relations of employers and employed necessitated the formation of a Joint Committee of officers and workmen to carry out the new scheme, and as it was thought that the head of the Committee should be the Chairman of the Company, Mr. Linging exchanged places with the Deputy-Chairman, who thus became head of the undertaking. Under his guidance, the fortunes of the Company and those whose lives are spent in its service have improved. About eight years ago, Sir George was elected a Director of the Commercial Gas Company; but he retired at the close of 1904, owing to the pressure of his public engagements. The Directors passed a resolution expressive of their regret at the resignation of their "esteemed and valued colleague," who for four years had afforded them the aid of his "ripe and unique experience and his conspicuous ability." It is pleasant to be able to record that his connection with the directorate of the Company had never been marked by the least difference with any of his colleagues. He had the gratification of seeing the Company enrolled in the list—now gradually increasing—of the gas companies who have adopted profit-sharing. The great interest shown by the late Sir George Livesey in labour questions led to his selection as a member of the Royal Commission appointed in 1891, though prominent labour agitators were passed over. He gave some valuable evidence before the Commission on the wages and hours of labour of the employees of the Company; and in the course of his active life he was frequently seen in the witness-chair before Commissions and Parliamentary Committees. His most recent appearance in this capacity was in May last, when he gave evidence on the Daylight Saving Bill. He was a member of the Royal Commission for the St. Louis Exhibition of 1904; and he served on the War Office Committee on the Employment of Ex-Soldiers. Rather more than ten years ago, the old Gas Companies' Association, of which Mr. Howard Charles Ward was Chairman and Mr. William Livesey the Secretary, was resuscitated, on the initiative of Sir George, with the title of the Gas Companies' Protection Association; and the first annual meeting was held on October 27, 1898, under his presidency. He was the first Chairman; but he resigned in 1903, and was made Vice-President—Mr. H. E. Jones succeeding him. Among other good work done by the Association was the part they took in obtaining the repeal of the sulphur clauses. Sir George Livesey was turned to from all quarters for advice, which he was always ready to give in the form of papers or reports, or in his capacity as host on the occasion of visits to the Company's works, which were open alike to his own countrymen and foreigners—even to Japanese. No one ever saw in these works any superfluous ornament.

Sir George Livesey joined the British Association of Gas

Managers in 1864, was President in 1874, was made an honorary member in 1879, and was the first recipient of the Birmingham Medal, in 1882. He passed into the Gas Institute; but resigned at the critical period in the history of that body. As our readers are aware, he was no mere "subscription-paying" member. He took a keen interest in the proceedings, as will be seen from the following list of his contributions to the Transactions:—

1866.—An Improved Method of Purifying Coal Gas.
1867.—Improved Method of Purifying Gas. [Supplement to previous paper.]
1869.—Purification of Gas by Ammoniacal Liquor.
1872.—The Hydraulic Main.
1875.—Hills's Liquor Process for Purifying Gas.
1876.—Concrete Tanks for Gasholders.
1878.—Experiments with Ammoniacal Liquor as a Purifying Agent.
1880.—Difficulties and Mistakes in the Construction of Gasholder Tanks.
1882.—Principles of Gasholder Construction.
1884.—Reduction of Sunday Labour.
1887.—The Sliding-Scale.
1888.—Commissions.

Before the Incorporated Institution of Gas Engineers he read papers on the following subjects:—

1892.—Profit-Sharing.
1893.—Differential Prices for Gas.
1894.—Relations of Capital and Labour.
1895.—Workmen's Funds for Sickness, Accident, Old Age, &c.
1896.—Measurement of Gas in Relation to Temperature.
1897.—Another Step in Promoting the Union of Capital and Labour.
1900.—Enrichment of Coal Gas.
1902.—Development of the Gasholder.

Before the new Institution he read only one paper—that on his favourite topic of "Co-Partnership" at the meeting last June.

He was a member of the Southern District Association of Gas Engineers and Managers, and was President in 1886. Before this Association, which always received much attention from him, he read a paper in November last upon the subject of profit-sharing, under the title of "Employers and Employed and Co-Partnership." This paper was afterwards printed for general distribution. He was admitted a member of the Institution of Civil Engineers in 1872, and a few years ago was elected a member of the Council. He was a member of the Committee for the Gas, Water, and Sewerage Works Section of the first Engineering Conference in 1897, was Chairman of the Gas Section at the International Engineering Congress held in Glasgow in 1901, and also of the Gas, Water, and Sewerage Works Section of the Conference held last summer in London. He was likewise a member of the Institution of Mechanical Engineers, having joined that body in 1901.

Sir George Livesey had the inventive faculty, as will be evident from the following list of the patents taken out by him:—

1862 (No. 1564).—Improvements in purifying gas.
1865 (No. 1818).—Treating ammonical liquor for purifying gas.
1869 (No. 3 82).—Apparatus used in the manufacture of gas.
1873 (No. 2016).—Manufacture of gas.
1875 (No. 1955).—Purifying gas.
1877 (No. 705).—Purifying gas.
1879 (No. 4704).—Making gas.
1890 (No. 6269).—Guiding gasholders.
1892 (No. 1909).—Preventing the freezing of water in gasholder cups or lutes.
1899 (No. 11,431).—Sreet lamps.

In bringing to a close what will doubtless be regarded as an altogether inadequate review of the life-work of the remarkable man who has unhappily been taken from us, it may be explained that no attempt has been made to deal with the many questions which occupied his attention. We have confined ourselves almost entirely to the South Metropolitan Gas Company and its management. Sir George Livesey recognized, and throughout his life acted upon, the broad general principle that in every industrial undertaking there is a tripartite interest—first of all, that of the capitalists who provide the money to keep it going; next, that of the workers who produce the commodity; and, lastly, the consumers who buy it—and his great aim was that each party should have proper consideration. To the shareholders was due the economical conduct of the works; to the employees, consideration for their adequate remuneration and general well-being; and to the consumers, inducement to a more liberal use of the commodity by cheapening it, and by facilitating their acquisition of a share in the undertaking. We have endeavoured to show how Sir George carried into effect the fundamental principle he held. In connection with each branch of the subject numerous questions arose which, regarded as insignificent perhaps by a superficial observer, did not escape the eye of a vigilant administrator of the calibre of the man whose loss we are deploring. He probably saw far-reaching consequences—to the gas industry primarily, and to the general trade of the country secondarily—from the adoption of some much-advocated popular policy; and he willingly associated himself with those who endeavoured to counteract what they considered to be its detrimental effect. Instances of this need not be cited now; they will be fresh in our readers' recollection. To some of the many questions arising in connection with Sir George Livesey's administrative work fuller reference will be made on some future occasion. For the present, we will close as we began with an expression of profound regret at the removal from our midst of one who was unquestionably the most striking personality connected with the great industry with which the "JOURNAL" has been so long identified.

THE LATE SIR GEORGE LIVESEY.

An Appreciation by "One Who Knew Him Well."

BY the death of Sir George Livesey, the gas industry has lost its recognized leader—a position he held without dispute. Born in 1834, he became at the age of fourteen an officer of the South Metropolitan Gas Company, succeeding his father, the late Mr. Thomas Livesey, as Secretary and Engineer, in 1872. On the Surrey Consumers' and Phœnix Gas Companies being absorbed by the South Metropolitan Company in 1880, he soon after joined the Board of the United Company, a little later was appointed Deputy-Chairman, and in 1885 he became Chairman.

He achieved fame by his own energy and his own genius; having an immense faculty for labour and a great power of inspiring confidence with those he came in contact with. Strong of mind, strong of will, and gifted with great penetration, he was always self-reliant; and when once he believed himself to be in the right, his whole energies became concentrated, and he persisted patiently, and with the success that is so well known, until his object was attained. At the same time he was extremely cautious before deciding upon his course of action. Indeed, his strength of character was remarkable; and he would not hesitate to state what was in his mind, though at the time of doing so he might be regarded as "one crying in the wilderness."

He worked for the gas industry with the highest intentions; and he was neither selfish nor anxious for his own glory alone. A man more brilliant and more original there has not been, nor one more honourable; and his name will be remembered and cherished by the profession as long as it lasts—particularly by the employees of all ranks of the South Metropolitan and the South Suburban Gas Companies, whom he loved and laboured for.

Not long ago, the writer recollects, when talking about duty, his saying there could be no rest; and, as characteristic of him, he quoted the words:

"Does the road wind uphill all the way?"
"Yes, to the very end."
"Will life's journey take the whole-long day?"
"From morn to night, my friend."

That he laboured from "morn to night" no one can doubt, and "to the very end" no one can deny. And now, alas! he has gone, with the consciousness of good work well done, of a life so full of achievement, so fertile in performance, that it may well and truthfully be said of him: "Take him for all in all, we shall not look upon his like again."

He will be remembered by me with affection to the end of my life.

FRANK BUSH.

An Appreciation by Mr. Charles Carpenter.

THE passing away of Sir George Livesey from the world of gas he loved so dearly, removes from it a personality the like of which it will not see again. For the past ten years the writer shared with him the same table as a desk, and he desires to pay a last tribute to one whom to know more was to love more. To the present generation, Sir George Livesey the statesmanlike administrator overshadowed Mr. Livesey the engineer. Yet he was a mechanician to the core; possessing in a high degree the two essential qualities of fertility of imagination and unwearying patience. He was always happy when inventing; and he often expressed to me his regret that the calls of public duties left him so little of his time to spend about the works. His greatest engineering achievement was the design of the modern gasholder, which, step by step, he lifted from rule-of-thumb and extravagance to the scientific standard it now occupies. By filling the tower scrubber with thin boards, he made it a most efficient appliance; and Livesey's washer is as "familiar in our mouths as household words."

Ever ready to lend a helpful hand to working men, his great chance did not come until the strike of 1889, when the master mind showed to the full its genius and its sympathy. Every step

in preparing for this struggle he took in consultation with his staff and foremen, who were thus kept in touch with every move in the contest waged by and against a most aggressive and militant Union. Under the greatest provocation, he never lost his temper nor was turned aside for a moment from following the one path he knew to lead to industrial peace and content. From the ashes of the strike fires rose up the spirit of Co-partnership, which stands to-day the one remedy for those troubles which menace so much of the labour world. Instead of the labour classes being left a prey to Socialism, he advocated their being built into the middle classes, whose power in the land has already become so great, and to which he saw in it an essential complement. We of the South Metropolitan Gas Company all know how well he succeeded.

He occupied the highest and the premier position in the gas industry; but he never used it to further a single selfish aim, for he had not one. He listened as patiently to the story of an out-of-work wanting a job as to those in high positions who sought his advice and counsel.

His two prominent characteristics were his sense of justice and his love of fair play. The writer was once discussing with him the mistrust felt by some engineers for secretaries. His remedy, emphatically expressed, was that the engineer, too, should have his seat at the Board-room table, and then if he could not take care of himself he was not worth caring for.

He had no respect for a professional witness serving two kinds of masters. Once in his earlier days, his assistance was asked by a highly-placed Government official on some matter of gas administration. "But," said he, "I am not an expert." "I do not want an *expert*," was the reply. His opinion on all sorts of subjects pertaining to the well-being of the community was valued because it was that of a keen and close observer forcibly expressed in common-sense language without fear or favour.

A little more than a week ago, he asked me if I would accept from him a lathe which had belonged to Beale, the inventor of the gas-exhauster. Now he lies dead, and there is no one to fill his place. From the highest to the lowest among us, we have lost our best friend; but we have faith that his example and his works will outlive us as they have outlived him.

CHARLES CARPENTER.

FROM "THE TIMES" OF YESTERDAY.

A commanding figure in the industrial world has passed away in the person of Sir George, or, to give him his full name, George Thomas, Livesey. Born in 1834, at Islington, the eldest son of the late Mr. Thomas Livesey, the Secretary of the South Metropolitan Gas Company, he entered the service of that concern when only fourteen years of age; so that it will be seen at once that his education, in the common acceptance of the term, was of the simplest description. He seems to have chosen his vocation very early in life, and to have made no mistake about it, rising in the year 1885 to the chairmanship of the Company—a position he retained, with credit to himself and advantage to the shareholders, until his death. He was an authority on every point connected with the manufacture of gas, and was personally familiar with all the processes; having in the course of his career worked in almost all departments of the undertaking. His whole life was devoted to gas making and to supplying it to the public at the minimum price and with the maximum of efficiency.

He had already established for himself a high reputation as a gas engineer when, in the late eighties, industrial difficulties arose which brought out in a conspicuous manner his qualities as a captain of industry, determined to be master in his own house, and to ensure the fulfilment of his obligations to the public at all costs. If interference with the proper working of the great business he managed could not be avoided by persuasion, he was ready, even eager, to meet force with force, and ruthlessly to stamp out disaffection. An innate perception of the essentials of a public service such as gas making led him, in view of the trend of events in the labour market, to wish to place his undertaking beyond the reach of the caprice of the employees who might be swayed by leaders to whom the public convenience and necessity were as nought, and to whom the possibility of injuring the capitalist might even be alluring. Actuated, therefore, by these motives, and by a genuine solicitude for the welfare of the workmen, he introduced, in 1889, a scheme of what was at first called "profit-sharing." The Trade Unions soon saw the drift of the scheme, and did their utmost to frustrate the proposals. It is unnecessary at this moment to state its details; suffice it to say that the stokers were enjoined to refuse to participate in it. A few men were found to have availed themselves of the scheme; and the upshot of the stokers' organized opposition to their action was a strike. Sir George Livesey met the movement with courage and determination, and, after a short and sharp struggle, which, however, cost over £100,000, the victory rested with him; and he was free to offer the men the terms which it might have been thought their leaders would have welcomed from the outset. What those terms were may be inferred from the question which Sir George Livesey often afterwards asked: "Was it not better to spend £100,000 in overcoming an occasional strike than to spend over £40,000 year by year in preventing one?" But he was always ready with the answer, given with his characteristic sincerity, that it was not. "I maintain that in a business of this sort there should be no possibility of any outside body interfering in any way with the supply of gas to the public." Supplementing that opinion in 1906 he referred to the Trades' Disputes Bill, and said that he looked upon the Trade Unions with absolute indifference, entirely ignoring them. "One object of that Bill is to 'peacefully and reasonably' persuade men to refrain from doing that which they would like to do; but we know that picketing means intimidation and nothing else. What hypocrisy has been used over this matter in Parliament. There is no need for an Act of Parliament to enable a man to do anything 'peacefully and reasonably.'" And, he added, "perhaps, if this Bill becomes law, employers may have to establish a force such as the Pinkerton Police of America for the protection of men who wish to work in face of a strike. But there is no reason for apprehension in the case of the South Metropolitan Gas Company, where there is no fear of any interference of that sort."

The scheme by which Sir George Livesey first rooted out disaffection and then reaped contentment was not in his view properly described as "profit-sharing." It was more than that—it was "co-partnership;" and its merits he never tired of telling both in public and privately. Progress was made with the development of the principle; and in the year 1906 the shareholders heard from him the gratifying announcement that the previous year's bonus had been the highest on record—9¾ per cent. on salaries and wages, equivalent to a sum of £44,000—the cost of the working of the scheme, about £1500 a year, having been borne by the Company. It was typical of the man that he never feared to take the employees and the public into his confidence; and he periodically recorded his opinions on the operation of the co-partnership plan. One of his pronouncements on it is worth quoting, as it gives a vivid insight into his character, and deals tersely with some of the difficulties with which he had to contend in helping the men to help themselves:

> Constant efforts have been made to induce all co-partners not to regard their bonus as a part of their ordinary income, but either to let it remain to make a provision for the future or to use it for some permanent benefit such as the purchase of a house. Those who withdraw their money or sell their stock without good reason [in 1894 the bonus had been increased on condition that one-half should be retained for investment in the Company's ordinary stock at the price of the day] are not permitted to renew their agreements until they adopt habits of thrift by saving a portion of their weekly wages. The results have exceeded all expectation. From the start, nearly one-half of the bonus has been saved. Nearly the whole of the annual bonus is now saved, and some 5000 men in the Company's constant employ have invested in the Company's stock and hold on deposit at interest over £300,000, while a large number have become owners of the houses in which they dwell. There are some thriftless ones; but they are gradually coming under the influence of the good example of their fellow-workmen. It has been suggested by some co-partners that we ought now to leave the thriftless men, who have been the cause of all the trouble, to take their course, stop their agreements, and, in fact, to get rid of them. But that is not quite a true co-partnership or Christian spirit. Remember that many among the co-partners were not so long ago among the thriftless; and if they had been left to take their course they would have been still in that class, whereas they are now the owners of property increasing year by year. This is a great satisfaction and reward to those who have patiently persevered in trying to induce them to alter their course.

Besides the bonus (which has steadily increased every year), the men also enjoy direct representation on the Board of the Company; and Sir George Livesey was convinced that the shareholders benefited by the advantages they had at his instance granted to the employees.

It has been objected by those who have at times criticized the co-partnership established in the South Metropolitan Gas Company that the men were treated as children; but Sir George Livesey invariably replied that in money matters many of the men were but children, and that his policy had made men of them. The mild coercion employed in getting them to take part in the scheme and to remain in it had been wholly for their benefit, especially as the bonus, of which they had, in not a few cases at first, been unwilling participants, had been in addition to the full current rate of wages. It was his unshaken opinion to the last that the principle of co-partnership, by which capital and labour are united in a common endeavour to produce and distribute wealth in the most efficient manner, was an industrial method well calculated to solve some of the most acute social problems. It need not be said that neither "conciliation" nor "arbitration" in labour disputes found favour in his sight. It must be added that his efforts to induce the directorate of other companies to adopt a scheme on the lines of the South Metropolitan Gas Company met with disappointment in almost every case. Still, he showed that it is a practicable measure in gas companies, and that by its adoption men who, in the great majority of cases, probably never possessed a penny after paying their current expenses, blossomed into small capitalists, and were stimulated by the scheme into habits of forethought which made for happiness, strengthened character, and industrial efficiency. With all its defects—and it no doubt has defects—the South Metropolitan scheme has done much good, and is a suggestive object-lesson in the solution of a social and industrial problem. It will always be remembered to the credit of Sir George Livesey that he devised and introduced it, and carried it to perfection in his own works, in the face of much opposition, and that he never lost faith in it as a means of improving the condition of the working classes and of securing industrial stability. Largely as the result of his efforts in South London, the gas worker as a class enjoys

to-day many benefits in the shape of sick pay and pension schemes, and other aids to thrift, and occupies a better position than many other manual workers.

The co-partnership principle was one that had always commended itself to Sir George Livesey, who was the originator of the sliding-scale as applied to gas companies, whereby the interests of consumers and shareholders are identified. He also took an active share in the endeavour to secure a fair system of assessment for rating purposes; and he took part in many a hard-fought fight at the County of London Sessions. In the witness-box he was admirable; his mastery of every detail of gas production and his dry humour making him a very formidable opponent. He was intolerant of technicalities, and had a hearty and undisguised contempt for the ordinary subtleties of the rating expert. Some years ago, he suggested a plan for the reform of assessment practice with regard to gas companies. [Sir George's views on this subject are given at length.] Everything bearing on the efficient service of the public in the matter of gas supply engaged Sir George Livesey's attention; and the interests of the shareholders, which, as has been shown, in his own companies included also the employees, ever received his earnest consideration. Gas work was his vocation. It was the task he found ready to his hand; and he did it with his might.

From Yesterday's "Pall Mall Gazette."

To the late Sir George Livesey belongs the credit of showing how to carry out in a practical way that reconciliation of social interests about which the majority of public men merely talk at large. The system of co-partnership which he applied to the management of the great producing concern under his direction has had the effect of raising its employees to a higher level, materially and morally, and of giving capital and labour the consciousness of a common purpose and a common stake. He taught his workers the advantage of thrift, and, by helping them to acquire a "capitalist" position for themselves, enabled them to appreciate and understand the functions of realized wealth. The organization of the South Metropolitan Gas Company remains a proof that the discords of industry can be subdued when the purpose of reconciliation is sincere and resourceful. It has only to be added that the benefits which Sir George Livesey conferred upon his workers met with the persistent hostility of Trade Unionism, and attracted to him from that quarter a constant stream of malevolent detraction.

In Memoriam.—By "An Ardent Admirer."

As one who lived a life of splendid zeal,
Of noble purpose and industrious aim,
Fearless throughout and high above all blame,
He passes forth; and we, who live to feel
The bitter loss, in silent sorrow kneel
To breathe a prayer in memory of his name.

His was the life of lives—a pattern great
For all who wish to serve their purpose well—
Strenuously wrought, whatever work befell,
And to the point e'en as an arrow straight.
This was the life that passes through the gate
Into the vale where but the shadows dwell.

OBITUARY.

The death occurred last Thursday afternoon, at the age of 72, of Mr. Caleb Rickman Kemp, J.P., the Chairman of the Lewes Gas Company. He was elected a Director of the Company in August, 1875, having for seven years previously been one of the Auditors. In 1888 he was elected Chairman. He did not seek re-election in 1891; but in 1898 he again joined the Board, and was replaced in his former office. In 1900 he was elected a Director of the Lewes Water-Works Company, and remained on the Board until his death.

Mr. Robert Good, late Manager of the Carshalton Gas-Works, died at his residence, "Toronto," Croydon, last Tuesday. He was appointed Manager at Carshalton in November, 1867, and continued to hold the appointment until the amalgamation of the Company with the Croydon Gas Company in 1894, when he retired on a well-earned pension. Mr. Good patented several inventions in connection with gas manufacture, &c., which did good service in their day. He died at the ripe age of 84, and was interred in the Carshalton Parish Churchyard, on Friday, in the presence of many old friends. Mr. William J. Russell followed from the house as representing the Directors of the Croydon Gas Company—he being, with Mr. Samuel E. Spencer, one of the Directors of the old Carshalton Company now sitting on the Board at Croydon. Mr. Benjamin Green, of Mitcham, was also among those who assembled at the graveside.

Mr. Brender à Brandis, Chemical Engineer, of The Hague Gas-Works, is to give a series of lectures on "Gas Manufacture" to students at the Technical University at Delft, Holland. It will be the first time that a course has been delivered there on this subject.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 72.)

The Stock Exchange is getting back to business of average magnitude after the autumn holidays, and last week was very fairly active, though it was account week. Movements were irregular; and a feature of the times is their artificiality—almost anything being seized as a bull or a bear point and worked for all it may be worth, or a deal more, to set a tide one way or the other. But Consols were regularly flat, falling a little almost every day. This is not surprising; for neither at home nor abroad is the aspect of affairs calculated to impart cheerfulness. The opening day was fair; Home Rails being cheerful and the general tendency favourable despite clouds on the international horizon. There were further rises in Gas issues, and, indeed, that may be said of almost every day of the week. The general features of Tuesday were similar to those of Monday. On Wednesday, the settlement engaged attention; but fresh business was not dull, and Home Rails still kept bright. Thursday opened fair, but soon began to manifest some languor after the conclusion of the account. By Friday this had intensified to a condition of flatness without a ray apparent in either domestic or foreign affairs to impart cheerfulness; realizations being the order of the day. Saturday brought nothing calculated to restore confidence; but a lot of business was done in speculative lines. In the Money Market, the position has been one of extreme ease, but slightly affected by the demands at the end of the quarter and for the Stock Exchange settlement. In the Gas Market, business was not heavy (not much stock coming into the market); but, as noted above, there was great strength. Prices were ready to rise at a touch, and many quotations made substantial advances, while some others look as if they ought to have had a rise. In Gaslight and Coke, the ordinary was rather quieter but very firm. The lowest price marked was 99¼; the highest, 99¾. In the secured issues, the preference was rather active at from 105½ to 107, the maximum was done at 88⅞, and the debentures at 86 and 87. South Metropolitan was quiet and steady; ranging from 121 free to 122. Commercials had a rise in each issue; the 4 per cent. marking from 108 to 108⅞, and the 3½ per cent. 103½. In the Suburban and Provincial group, Brentford old marked 246, ditto new 185, Brighton original 207, British 42⅞, Hastings 3½ per cent. 94 and 94¾, South Suburban 117½, ditto preference 117, ditto debenture 122 free, Wandsworth "B" 126, and West Ham 103½. Their quotational variations are shown in the share list. In the Continental companies, there was a fair degree of activity in Imperial, which changed hands at from 181½ to 183½. European fully-paid realized 23¾; and Union preference 140 and 140¾. Among the undertakings of the remoter world, Buenos Ayres was done at 11⅝, Melbourne 5 per cent. at 103 *cum div.*, Primitiva at 5 1/16, ditto preference at 5, River Plate at 13⅝, ditto debenture at 93¾, and San Paulo at 14 *cum div.*

ELECTRICITY SUPPLY MEMORANDA.

Evidence for Street-Lamp Conversion—Literary Productions and Cookery Demonstrations—The Faith of Caterers—Cost of Wholesale Cooking of Chops and Steaks—Copying the Chinese Slavery Cartoons—The Paris Fire.

The inquiry into an application by the Beckenham District Council for £1750 for converting not the whole, but a part, of the incandescent gas-lamps in the streets to metallic filament electric lamps seems to have been an altogether one-sided affair—that is, judging from the reports in the local papers—and without any proper presentment by Council officials of the relative positions of gas and electricity as street-lighting agents. It is to be hoped that the Local Government Board, before assenting to grant the loan, will inquire whether, at the inquiry, they had all the facts before them, and whether things are exactly as they were stated. It will be remembered that a short time since the South Suburban Gas Company, on the proposed change being mooted, offered to make an experimental demonstration with inverted incandescent gas-mantles for street purposes; but at the inquiry there appears to have been a well-feigned ignorance of the inverted gas-lamp being a competitor of the metallic filament electric lamp, in any shape or form, for street-lighting purposes. The comparisons made were with vertical mantled burners, which a representative of the Council said had a nominal illuminating power of 60 candles, but an average illuminating power of only 37·8 candles. The Electricity Department, it was declared, had not so far found one mantle giving the nominal power. There is nothing surprising about this; we have seen electricians' tests that have declared the illuminating power of a nominal 60-candle power gas-burner to be about 14 or 15 candles—in fact, according to electrical photometry, the efficiency of such burners may be anything from such absurd figures as 5 candles up to about 12 candles per cubic foot of gas, but never under any circumstances anything higher. The average illuminating power of the metallic filament lamps in the Beckenham trials worked out to 36·5 candles. Therefore, it would be interesting to know why the Council propose to spend £1750 in replacing 596 gas-lamps with 572 metallic filament lamps which, on an average give, it is admitted, a less illuminating power than the much-maligned

vertical gas mantle. We do not agree with the 36·8 candles as the illuminating power of nominal 60-candle power vertical incandescent gas-lamps. But assuming the correctness of the figure, the 596 gas-lamps to be displaced would give a total illuminating power of 22,529 candles; while the 572 metallic filaments, taking the average of 36·5 candles, will only give a total illuminating power of 20,878 candles. Thus the ratepayers are to have less illuminating power and a fewer number of points of lighting in the streets, at the same annual charge (we assume not including maintenance), *plus* the charges for sinking fund and interest for the money spent on conversion. This is not economical local management. We should dearly have liked to have heard the electrical witnesses on a comparison with the inverted gas-lamp. The Council are proposing to pay the electricity undertaking the same money for the lighting as they pay to the Gas Companies, *plus* an expenditure of about £3 1s. on the conversion of each lamp. We should be interested to learn the price the Department will receive per unit of electricity consumed. The Local Government Board will also note that the average life of the metallic lamps is put at 1602 hours, calculated on a test that has run night and day, without subjecting the metallic filaments to the daily change they undergo from brittle to soft and from soft to brittle by lighting up and extinguishing in the customary way. Life tests should be made under normal conditions, and not the abnormal ones chosen for the purpose at Beckenham. If the Local Government Board Inspector is satisfied with the evidence laid before him on this occasion—well, he is easily satisfied.

It would ill-become us not to give, when it can be done with so little effort, a measure of pleasure to "Electrical Industries." It appears, according to our contemporary, that "the publicity department of the St. Marylebone Borough Council is distinguished by the high quality of the literature it produces, and the well developed organization for its distribution. Mr. Wilkinson's latest enterprise in this"—that is to say, in the literary—"direction is the arrangement of an electric cooking exhibit at Messrs. James Fleming's Restaurants, Limited, 68, Oxford Street." There is something wrong about a cooking exhibit being classified as literature; and therefore it may be taken that the publicity department of the Marylebone Borough Council, distinguished, as it is, by the high quality of the literature it produces, had not an opportunity of revising the proof of the article now before us prior to its publication. In addition to this installation, Mr. Wilkinson—who is the Resident Engineer of the St. Marylebone electricity undertaking—has arranged a demonstration grill at Slater's in Oxford Street and at a couple of public houses; and the department is also planning the lending out of apparatus in this manner to several other restaurants, dining-rooms, and flats in the borough. Just so. But our electrical contemporary wants to know what we think of this demonstration, and awaits with "particularly pleasurable anticipation" our "tearful disgust." This is picturesque language. We fail to find anything in the article for ordinary disgust on our part, much less for the superlative form of disgust that warrants the description "tearful."

If, however, a few comments on the article will afford pleasure, we are glad to oblige. We note in the first place that all this apparatus is to be "lent" by the department, including (we had almost overlooked this) a large oven to Messrs. D. H. Evans & Co., of Oxford Street, which will be used side by side with several gas-ovens. Being "lent," it shows that the users have not felt disposed to purchase on their own account. The 1⅛d. (about) per unit received by the department for the electricity consumed at Fleming's will not pay for the electricity, much less for the apparatus. Should those caterers who are lending themselves to the demonstration ever contemplate the purchase of apparatus of the kind, they will not be long in ascertaining more than they know at the present time both about first cost and the expense of maintenance. And after a while, they will also appreciate the necessity of keeping a trained hand on the premises to deal promptly with the disorganization when anything happens to go wrong. We can hardly imagine Fleming's and Slater's—who do not, as a rule, do business on the credit system—putting their trust in, and confiding their reputations to, electrical apparatus. A breakdown during the preparations for meals, and where would Fleming's and Slater's be? It is on record that collapses do happen through various causes even at electrical generating-stations (Marylebone has not missed them), and at several other places between the stations and the points of the use of the electricity. But let this aspect of the matter rest for the future consideration of the caterers concerned. The article in our contemporary has rather little substance over which to crow so loudly. The apparatus at Fleming's seems to be of about a size that would suit an ordinary household. It apparently comprises one four-heat oven (dimensions not stated); a 15-inch by 10-inch grill (a size of griller frequently supplied to working men's houses under the prepayment gas system), consuming 1800 watts per hour, and taking eight to ten minutes to cook chops; a toaster of similar construction to the grill; an egg poacher, consuming 600 watts per hour; and a hot-plate. The two principal features are that this is by no means large capacity apparatus, and that it seems to be apparatus very voracious in the matter of electricity for the work done. The next point is that the experience in the article extends over only eight days with this nice and new apparatus. We shall be pleased to hear Mr. Fleming on the subject (say) some time next spring.

The account of the consumption and work done during the eight days at Fleming's is stated thus: The average daily consumption was 39½ units, the cost of which is approximately 3s. 8d.; it being calculated that the price on the maximum demand system will work out at about 1⅛d. per unit. The "large" grill will cook twelve chops at a time; and the cost in this case is slightly over 1½d. per hour. In eight days 678 chops and steaks were cooked on the grill; and the cost per chop or steak worked out at $\frac{3}{16}$d. There is nothing extraordinary to make a fuss over in a consumption of 39½ units of electricity in a working day by such appliances as those described. They do not appear to be economical; the economy is in the charge per unit made by the Electricity Department. Certainly such a consumption at 1½d. per unit in the case of an undertaking whose costs (excluding sinking fund, interest, maintenance, and renewal) work out at—according to the "Electrical Times"—1·45d. per unit, does not suggest a very lucrative line of business. The average charge for private supply is stated by the same authority to be 4·54d. per unit. We see in this 4·54d. some of the expense of cooking Fleming's noted chops and steaks; and the attention of ordinary electricity consumers might be specially directed to this phase of the matter by "Electrical Industries." Of course, we know and the ratepayers know that the Marylebone Electricity Department must do something in order to cultivate more business. Mr. Arthur Wright, the Consulting Engineer, has warned the Council that no one knows of what amount of consumption the metallic filament lamp is going to relieve them. But are the Committee going the right way to work to supplement income by supplying electricity for cooking chops and steaks and poaching eggs at an average cost of 1½d. per unit? The undertaking can do with more business, but not of this kind. However, why need we direct attention to this matter? While they are doing this kind of thing, they are imposing difficulties in the way of reductions to the lighting consumer; and that is in favour of gas lighting. Of course, the tale is only half told, so long as there is this brevity of experience and the apparatus is merely "lent" for advertising purposes. We hope there is no sign of tearful disgust here; but if we have given "Electrical Industries" any pleasure, there will be gratification on our part.

Gas men will possibly shortly see on the bill-posting stations in their several districts some libellous posters, which the "Electrician" states are intended "for booming electricity supply." The managers of electricity undertakings must be hard put to it, if they are compelled to have recourse to such low tactics as are represented by these slanderous pictorial posters. They are fit companions of the Chinese slavery cartoons of the last General Election. Miniature reproductions of these posters (which emanate from the Associated Municipal Engineers of London) have been published in both the "Electrical Times" and the "Electrician." The former paper acknowledges that the posters are "as large as life, *and rather more highly coloured*." We are in agreement over this; and would add that, if they represent the degree of refinement and good taste of the "Associated" Municipal Engineers of London, we do not envy them. The "Electrician" thinks this form of pictorial falsehood should "do a large amount of good;" and that the Associated Municipal Engineers are "to be congratulated on taking what is practically the first organized step in this direction."

The first of the series of posters is supposed to show companion pictures, illustrating the respective effects of electricity and gas upon the "average docile domesticated female." As the "Electrician" thinks well of these posters, its description of the first one may here be given: "The gas picture portrays in a striking manner the demoralizing influence of *the deadly agent* either as an illuminant or as a domestic heater. The influence of the *fumes of gas* is shown as not confined to the lady herself, who forms the central figure of the picture, but to have spread to her pets in the shape of a cat and a parrot. In contradistinction the electricity picture is all life and energy, and the lady engaged in the congenial occupation of preparing the cup that cheers by means of an electric kettle. Both the cat and the parrot are all smiles, and 'everything in the garden is lovely.' We are left to assume a smile on the face of the cat, as that animal has turned its face to the genial glow of the radiator. Of the parrot's glee there is no reasonable doubt, but why, we ask, is the electric fan out of action? We think the posters will not only influence the sales of electricity in a district, but will create something of a sensation in 'gaseous' circles." The "deadly agent!" We certainly expected something different from this at the hands of those responsible for the literary matter in the "Electrician." However, to imitate the Chinese slavery posters in this way is playing the game very low; and the surprising thing is that electricians should glory in placarding walls with such palpable evidence of mean slander, and of being engaged in a cause requiring pictorial fabrication to aid it. It is regrettable that even in their "associated" condition, the Municipal Electrical Engineers of London exhibit such abject weakness.

It will be remembered that the inquiry at West Ham into an application for a loan for electricity purposes recently, was adjourned *sine die* by Mr. H. R. Hooper, owing to a deadlock that arose through the Electricity Department's representatives declining to divulge the price at which electricity is being supplied for power purposes to certain consumers; large ratepayers entertaining the view that the consumers in question derive their electricity supply at less than cost price. Mr. Hooper adjourned the inquiry to enable him to take counsel with the powers that be at the Local Government Board. Meanwhile, two of the customers—whether voluntarily or on suggestion—have, it is now

stated, "strongly objected to the terms of their contracts being made public." This action is not in the interests of the undertaking, as it savours of confirmation of the avowed belief of the discontented ratepayers. What is there to be ashamed of in the prices paid? The electrical engineer has suggested rather a crude way out of the difficulty. His plan is to engage the services of an expert to examine the contracts with the view of supporting his evidence at the adjourned inquiry, or to lay the whole position before the Local Government Board, should it be considered desirable. This has been agreed to by the Electricity Committee. In the same paragraph, however, in which this announcement is made, the intelligence is published that the Committee are recommending that the amount of the ascertained deficit on the electricity undertaking accounts for the last financial year should be provided for in the rate estimates for the next half year. For whose electricity are ratepayers generally being called upon to partly pay? The ratepayers should call upon the Council to refer to the expert engaged to inquire from which branch of the undertaking's business the deficit arose, with the view of taking steps to obviate its recurrence.

It is a pleasure to see that the little reference last week to the great fire at the Paris telephone exchange contained nothing that exposes us to attack from those interested in electricity. The station, it is remarked, had just been remodelled on the central battery system. One of the electrical papers states that "a short on one of the cables in the basement, *possibly due to leakage from a lighting main*, started the mischief." Also "that the inflammable insulation of the telephone conductors is ideal material for spreading a fire; and soon the whole building was ablaze." Nevertheless, another electrical contemporary is surprised that, although nearly the whole of the fire brigade of Paris are said to have been on the scene of the conflagration, "all attempts at subduing the fire were fruitless." The loss is estimated at from £800,000 to £1,000,000—all owing to a short, "possibly due to a leakage from a lighting main."

HIGH-PRESSURE GAS DISTRIBUTION.

THERE has been of late a tendency on the part of firms dealing in specialized apparatus to include in their catalogues a good deal of technical knowledge as to the underlying principles of the system for which the plant is intended. To some extent, therefore, the catalogues become monographs on the subject, and are of educational value to the uninitiated.

An instance of this kind has just come to hand in a pamphlet of some 30 pages issued by the Bryan Donkin Company, Limited, on the "Transmission and Distribution of Gas at High Pressure." This is a clear account of the general problem, the conditions which may necessitate the adoption of the system, the methods of effecting the required transmission of gas through small mains, the plant usable, and the effect of varying pressures upon discharge, as well as the constituents of the gas itself; and it is written in such a way that it may almost be taken at once as a contribution to the general question, and an advertisement of the excellent plan with which the firm are identified.

The difficulties of gas distribution are increasing in consequence of growing gas outputs, the addition of new areas, and the general use of incandescent gas-burners. In the old days of flat-flame burners, gas consumers at the extremes of the district "managed" somehow to get along with comparatively low pressures; but the adoption of incandescent burners has rendered their need for higher pressures a crying one. The relaying of mains for these purposes means, of course, heavy expense in consequence of their length and increased size; and the probably already heavy capital spent in obtaining fresh gas custom makes the renewal of miles of pipe a serious matter. By the adoption of the high-pressure system of transmission, allowing large quantities of gas to pass through the existing pipes, or through small boosting mains, gas undertakings here and there have to some extent found salvation; and not a few probably are looking in this direction for relief from their difficulties. The method is undoubtedly worth considering by all who have trouble in serving customers at the extreme ends of their districts or in maintaining efficient pressures throughout their area.

In the pamphlet referred to, some help and guidance on the subject may be usefully found, and particularly if read in conjunction with Mr. R. M. Searle's 1907 Institution of Gas Engineers paper, since the firm are acting as agents for some of the apparatus described and illustrated by him. The writer of the pamphlet suggests that the system is a very valuable and economical addition to the ordinary methods of distribution, although he is careful to say that it is not one which can be applied indiscriminately. For transmission work, it is a cheap way of sending large volumes of gas to outlying holders or district governors, and for purely distribution purposes it permits large areas to be profitably served. The advantages of the system are indicated by the following facts: (1) For mains of equal diameter, the carrying capacity with high pressures is very much greater than with low pressures. (2) To transmit a given quantity of gas for any distance the initial outlay on mains is very much reduced if high pressures can be used. (3) The cost of compressing gas to the requisite pressures is very small, and practically negligible with moderate pressures. (4) The illuminating power of gas is not affected to any appreciable extent by compression to a moderate amount.

The pamphlet gives descriptions and illustrations of two arrangements of simple "pressure raising" plants—one as fixed at the works and the other in the district. Briefly, the plant consists of a gas-engine and pressure blower, main pipes to the latter and leading respectively from and to the trunk main, one inlet pressure governor to prevent pressure in the supply main falling below the given limit, another governor on the outlet to maintain the required pressure in the delivery main, and the necessary valves—including one for relief purposes. These plants can be used whenever the holder pressure is insufficient; and they are found to be suitable for giving moderate increases of pressure up to 36 inches if necessary. In the case of the high-pressure system proper, the following plant is in most cases necessary: Gas compressing machinery; pulsation and baffle tanks to remove moisture; main for conveying gas; and pressure-reducing governors for admitting the gas either into the low-pressure mains or direct to the consumers.

For compression purposes, fans are unsuitable; Roots' blowers are not altogether serviceable; and rotary gas-exhausters have apparently their defects. The Bryan Donkin Company are, therefore, introducing a rotary compressor, which, retaining the advantages of the exhauster, is specially designed for high-pressure work. Of this, an illustrated description is given in the pamphlet. Dealing with the question of compression, emphasis is laid on the fact that this to a moderate extent has very small effect on the illuminating value of the gas, and reference is made to several important public tests on the subject. In this connection it may be said that Mr. Searle regarded the loss due to compression and transmission as a factor to be reckoned with, considering that it was about twice what would be the case in the low-pressure system. It will be remembered, however, that in the investigation on a long-distance main (about six miles) at St. Gall, Switzerland, the drop in candle power was found to be too small to be of practical importance, and, further, that there appeared to be no, or but little, drop in the calorific value.

In discussing mains and their capacity, the firm quote Pole's formula, and point out that this is only accurate for low pressures. For high pressures, tests have shown that as the pressure is raised the delivery tends to become more and more in direct proportion to the initial pressure if the final pressure is kept constant. Cox's formula (also quoted by Mr. Searle) is given as closely according with actual experience. Referring to the pipes themselves, it is stated that lead socket joints, if well caulked, have been found satisfactory in high-pressure work, but wrought-iron or steel piping is preferable for new work. Services can be taken off the latter by means of special saddle fittings similar to those described by Mr. Searle in his paper—the illustrations, indeed, being the same. While recognizing the decreased cost of main canalization under the high-pressure system, it would be interesting to know how far in an ordinary distribution scheme the extra expense of these special connections, together with the service governors (which are also described), act as an off-set to the saving to be effected. So far as steel pipes are concerned, we understand that, in the case of one make, at any rate, these are being provided with ribbed sides for the purpose of being drilled and tapped in the ordinary way.

The Bryan Donkin Company are the sole European agents for Reynolds' high-pressure district and service governors; and these are adequately described. Their action was also explained and illustrated by Mr. Searle. Some clear sketch plans are given showing their arrangement in connection with the trunk piping, and charts are reproduced indicating both inlet and outlet pressures with these governors in action. Schemes are outlined for three different sets of conditions—viz., for the supply of gas under high pressure to a district; for the reinforcement of low-pressure mains by an auxiliary high-pressure supply; and for the filling of district holders. The respective advantages of these will be readily appreciated by gas engineers, and need scarcely be elaborated here. The pamphlet gives all necessary particulars.

There should be a future for high-pressure systems, which have already found acceptance in some districts. We happen to know, too, that—apart from what the Bryan Donkin Company may be doing in the matter—several high-pressure schemes are at the present time being executed in the country, and in many of these steel pipes are being used, especially in mining districts. There should be, sooner or later, a good crop of papers dealing with the whole subject; and we fancy many will look forward with interest to these, and particularly for information as to efficiency and relative economy.

The pamphlet concludes with a reprint from the "JOURNAL" for July 19, 1904, of an article on the high and low pressure distribution methods adopted at St. Louis, U.S.A.

At the Annual Meeting on the 17th inst. of the Yorkshire Junior Gas Association, an address will be delivered by Mr. Walter Hole, of Leeds.

Mr. F. J. Bancroft, B.Sc., left Hull last Tuesday to take up his duties as Engineer and Manager of the Barnet District Gas and Water Company, in succession to Mr. T. H. Martin. At a sitting of a Sub-Committee of the Water and Gas Committee of the Corporation held the previous afternoon, he took leave of several of the members of the Committee. He enters upon his new appointment with the good wishes of all who know him.

GAS ACTS FOR 1908.

[THIRD ARTICLE.]

TO-DAY we complete the review of the Acts for the past session dealing with gas supply, by noticing the measures promoted by Local Authorities. Most of the Acts are of the composite order in which many matters of local importance are supplemented by additional powers.

In the Blackburn Corporation Act, there is a section labelled "Gas and Electricity." Eight or nine of the clauses refer to gas. They are all of common form, excepting the first, which extends the limits of the gas supply area so as to include the township of Clayton-le-Dale. In the Bill, the clause referring to the period of error in defective meters reads "such erroneous registration shall be deemed to have first arisen during the then current quarter." In reviewing the Bills last January, this variation from the modern style of clause was pointed out. There has been adjustment during the progress of the measure, so that it now reads "such erroneous registration shall be deemed to have first arisen during the then last preceding quarter of the year, unless it be proved to have arisen during the then current quarter." The clauses have been deleted that proposed the cutting-off of both gas and electricity supplies, where a consumer was in arrear for either the one or the other. But the Corporation (like many other electricity suppliers in this and previous sessions) have obtained, in respect of their electricity supply, what is denied to gas suppliers—the right to demand, in cases of the supply of electrical energy to premises having a separate supply, such minimum annual sum as will give the Corporation a reasonable return on such a proportion of the capital expenditure and standing charges incurred by them as is properly attributable to the possible maximum demand of such person. We miss from the Act the provisions authorizing, and stating the conditions of, a superannuation or provident fund for persons in the employ of the Corporation. [*Parliamentary Agents: Messrs. Tahourdins and Hitchcock.*]

In the short section headed "Gas" in the Burnley Corporation Act, three of the clauses are of the usual form; and a fourth allows the Corporation to sell and supply gas in the township or parish of Cliviger as if that township abutted upon the borough within the meaning of section 158 of the Act of 1871. A reserve fund is also provided for. For Corporation employees, power is given to establish a fund for the encouragement of thrift, and with a view of providing a sum of money which, in the event of retirement, discharge, or death of any person in the service of the Corporation who has contributed to the fund, shall be available for himself or his representatives. Authority is also given to create an accident fund. The sale of coke clauses to which allusion was made when noticing the Bill on Jan. 21 last have disappeared. [*Parliamentary Agents: Messrs. Lewin, Gregory, and Anderson.*]

The section of the Keighley Corporation Act referring to gas and electricity contains nothing but ordinary clauses. In the financial section, power is given to form reserve or renewals funds in connection with the municipal trading undertakings. The clause in the Bill proposing the making good of deficiencies on one or more trading undertakings out of the profits made on one or more of the others is not found in the Act. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

By the Leicester Corporation Act, the limits of gas supply are extended to include Markfield, Rothley, Swithland, and Woodhouse. It is enacted that if, at any time after the passing of the Act, any Sanitary Authority, whose district is beyond the limits of the Corporation for the supply of gas as they exist at the passing of this Act, but within the additional gas limits, shall give not less than six months' notice of their desire to purchase such portion of the gas-works and plant as is within their district, and shall obtain the consent of the Local Government Board, and secure power from Parliament or from the Board to purchase, the Corporation are not to oppose, but shall sell by agreement or arbitration under the Lands Clauses Act. For testing the illuminating power of the gas, authorization is given to the use of the "Metropolitan" No. 2 burner, and the Harcourt 10-candle pentane lamp. An accident fund for Corporation employees is provided for. [*Parliamentary Agents: Messrs. Dyson and Co.*]

In the "Miscellaneous" section of the Manchester Corporation Act, there is one clause which provides that, from and after the passing of the Act, "the Acts of Parliament relating to the gas undertaking of the Stretford Company shall cease to apply to, or be in force in, the township of Chorlton-cum-Hardy in the city." [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

By the Padiham District Council Act, the limits of supply for gas purposes have been extended so as to comprise the townships of Sabden, Read, and Simonstone; but if the Council do not within two years lay a main into Sabden, any other body or company can apply for the right to supply, just as if the Act had not been passed. The proposal as to the extension to Altham has disappeared during the progress of the measure. The Council have been authorized to purchase the gas-mains belonging to the Parish Council of Read, by agreement or arbitration by a single arbitrator to be appointed by the Local Government Board. Power is granted for the construction of gas-works on additional gas lands. Sanction is given to extra gas charges in the extended area of supply. For a supply in Sabden, the additional charge is not to exceed 1s. 3d. per 1000 cubic feet of gas; and for a supply in any other part of their limits outside the Council district, the prices are not to exceed by more than 6d. per 1000 cubic feet the corresponding charges for the time being within the district. But no charge is to be in excess of the maximum allowed by the Council's Act of 1876. The ordinary prepayment meter clauses are applied, and *minus* the addendum proposed in the Bill, whereby consumers of less than 3000 cubic feet in a quarter might have been charged, if thought fit by the Council, up to an additional 2s. rent. The standard illuminating power of the gas is to be 14 candles, tested by the modern means. The Council have obtained the financial powers requested for the gas-works—£40,000 for new works and the purchase of the Read mains and pipes, and £5000 for cookers and meters and fitting up; the periods of repayment being respectively thirty and ten years. Authorization is also given to the borrowing of money for the redemption of gas and water annuities by agreement.

The Wath and Bolton Gas Board Act provides for the constitution of a Board of ten members, to consist of six members from the Wath District Council and four from the Bolton District Council. By agreement, they are acquiring the undertaking of the Wath-upon-Dearne and District Gas Company, Limited—the agreement bearing date Jan. 23 last. The issued share capital of the Company is £35,000; and debentures have been issued, of which £7800 is still owing. The purchase price is £69,430 12s. 1d. From the purchase money, the sum of £480 is to be paid to the Secretary and Directors of the Company as compensation for loss of office. If so desired by Mr. George Wright, the Company's Manager, the Council may enter into an agreement to employ him for a term of three years, at a salary of not less than £210 per annum. All the ordinary clauses relating to such purchase and transfer appear in the Act. Looking at the general clauses, it is seen that the fittings supply and hire clause orders that the charges made for them are to be so adjusted as to meet all expenditure, including interest and sinking fund; and a separate account is to be kept. The price of gas is limited to 4s. 2d. per 1000 cubic feet, for gas supplied of a standard illuminating power of 14 candles, tested by the "Metropolitan" No. 2 burner, and the Harcourt 10-candle pentane lamp. In Thurnscoe and Brampton Bierlow, the price of gas for public lighting or private consumers is not to exceed the lowest price charged by the Board for a like supply within any other parts of the limits of supply. If the Thurnscoe authority, at any time after Dec. 31, 1912, give not less than six months' notice, they may purchase such portion of the undertaking as is contained within their district, on obtaining the necessary parliamentary powers; the terms to be fixed by agreement or arbitration under the Lands Clauses Act. In such event, provision is made for the supply by the Board of gas in bulk to the Thurnscoe authority, if so desired by them. The Board are authorized to borrow £70,000 for the purposes of the purchase; and for extension, &c., such sums as are approved by the Local Government Board. The purchase money is to be paid off within forty years; money borrowed by sanction of the Local Government Board within such period as may be fixed by them—not exceeding sixty years; and the amount required for the costs incidental to the Act, five years. [*Parliamentary Agents: Messrs. Sherwood & Co.*]

The Widnes Corporation Bill was noticed in January last as containing certain ordinary clauses referring to gas supply; but the controversial one, referring to the disposal by the Council of the gas profits, instead of using them for the benefit of the gas undertaking and the consumers, was, it will be recollected, cancelled by the fiat of the ratepayers in public meeting. There is therefore nothing in the Act calling for notice here. [*Parliamentary Agents: Messrs. Hargreaves, Crowthers, & Jordan.*]

PERSONAL.

The position of Engineer and Manager of the Hornsey Gas Company (rendered vacant by the death last month of Mr. Henry J. Mitchell) has been filled by the appointment of Mr. JOSEPH W. BUCKLEY, Assoc.M.Inst.C.E., who has for the past few years occupied a similar position with the Devonport Gas Committee. Readers of the "JOURNAL" will be aware that Mr. Buckley, who was previously at Falmouth, has given great satisfaction to the authorities at Devonport by the manner in which he has steered the undertaking through a difficult period.

Some of our readers, especially those in the South-West of England, will certainly remember Mr. F. G. COCKEY, who was at one time Engineer and Manager of the Newport (Isle of Wight) Gas-Works—a position he relinquished about seven years ago to take the management of the gas-works at New Swindon—and who had previously been Assistant at Worcester and Shanghai. He gave up the appointment at Swindon in order to become Manager to the Fulham Steel-Works Company, Limited, constructional engineers. We learn that he has lately been selected for the post of Chief Engineer of the gas-works and electricity generating plant of the Bahia Tramway, Light, and Power Company, and left England last Friday to take up his duties. The works are owned by the Compagnie d'Eclairage de Bahia—a Belgian undertaking controlled by the English Company just named, whose London offices are in Threadneedle House, E.C. The population of Bahia is about 235,000; and the sales of gas last year amounted to 102 million cubic feet.

LABOUR DISPUTES DURING THE PAST YEAR.

WHAT the future may have in store, no one can with certainty foretell; but that which has happened in various directions is set out in numerous statistical books issued from time to time by the Government Departments. To-day everyone is wondering what will be the outcome of the breach between the employers in the cotton trade and a section of their workpeople; and also whether Sir Christopher Furness's employees will take heed of his threat to close certain shipbuilding yards unless some guarantee is forthcoming that the constantly recurring labour troubles will cease. Next year these things will be matter of history; and it can only be hoped that they will then give more certain proof of the possession of a large amount of good sense on the part of the employees concerned than at the present time seems likely. There have, of course, been successful strikes; but on the other hand there is to be considered the possible effect on the working classes of the "fighting policy" of the Trade Unions which is indicated by Sir Christopher Furness in his letter to those Unions connected with the shipbuilding industry. In this, he points out that the losses incurred in their shipbuilding brauch by Messrs. Furness, Withy, and Co., Limited, as the result of continuously recurring labour troubles, have been such that the Directors "will not again risk the injury of the Company's interests" through this cause. So far, therefore, from benefiting permanently from these disputes, the workers are thus plainly threatened with the total loss of their employment, if they do not mend their ways. The question for Trade Unions and their members to decide is, of course, whether by the adoption of a certain line of action the chances of gain are greater than the probabilities of loss; and that is where the study of history is likely to be of service to them. This being so, attention may be drawn to the recent issue of the Twentieth Annual Report on Strikes and Lock-Outs in the United Kingdom during the year 1907, which has been drawn up by Mr. A. Wilson Fox, of the Labour Department of the Board of Trade. The report also deals with the work of Conciliation and Arbitration Boards; but notice of this must be left to another occasion—confining ourselves for the present to the cases of open warfare which occurred last year.

To begin at the end, let us see what proportion of immediate success attended the employees as the result of disputes entailing a cessation of work in 1907; though it must be pointed out that in these figures, of course, no account is taken of any possible permanent losses, alike to masters and men, through diversion of trade to other channels—perhaps even to other countries—in consequence of the disputes. The principal cause of disputes was, as is generally the case, the question of remuneration; and we find that in disputes arising out of demands for advances in wages the workpeople were successful as regarded 25 per cent. of their number, while 35 per cent. were unsuccessful, and compromises (which involved some increase in wages) were effected by 40 per cent. of the workpeople. As to proposed reductions in wages, resistance was successfully offered in the case of 15 per cent. of the workpeople involved and unsuccessfully by 36 per cent.; while the remaining 49 per cent. effected compromises. In all the wages disputes, 27 per cent. of the workpeople attained their object, 28 per cent. did not do so, and 45 per cent. arranged compromises. In disputes regarding hours of labour, success was about equally divided; but in the case of troubles arising on questions of "Trades Union principle," the great majority of the strikers were successful. In all other classes of disputes nearly 16 per cent. of the workpeople involved were successful, 38 per cent. unsuccessful, and 46 per cent. effected compromises. Striking a balance, the total results for 1907, as regards the proportion of persons directly involved in disputes, were: In favour of the workpeople, 32·6 per cent.; in favour of the employers, 27 per cent.; compromised, 40·1 per cent.; and indefinite or unsettled, 0·3 per cent. The proportion of workpeople successful in the previous year was much larger—42·5 per cent. The proportion unsuccessful showed little change (in 1906 it was 24·5 per cent.); but the proportion of workpeople who effected compromises (33 per cent. in 1906) largely increased last year. With regard to the 32·6 per cent. of the workpeople involved who were successful in 1907, the report says: "If, however, disputes affecting the employment of non-Unionists, which may be regarded as not directly concerning the employers to the same extent as other disputes, be excluded, the proportion would be materially reduced; and it would be found that, on the whole, the balance of success lay with the employers." These successful strikes against non-Unionists were mainly in connection with the coal mining and quarrying industry, where the proportion of workpeople successful in disputes was as high as 54·8 per cent.

Shortly put then, the report shows that, judging from last year's experience, the probabilities of full success in the case of a strike are none too rosy, even taking into account the strikes against non-Unionists and the compromises; and the prospect is still less favourable when the last-named factors are eliminated, and some account is taken of the monetary sacrifices entailed on the employees directly concerned, and perhaps many others, whether or not they are eventually successful in attaining their object. One may, however, fairly assume that in many cases the "compromises" might have been secured by other less drastic methods; while the disputes involving the thousands of members of the Miners' Federation who struck against the employment of a handful of men who refused to subscribe to the funds of the organization were, as the report says, in reality between one body of workpeople and another. The total number of disputes which began last year was 601, against 486 in 1906, and 358 in 1905; but to compensate for the greater number, the bodies of workpeople generally involved were smaller. Thus in 1907 there were 147,498 persons directly and indirectly concerned in disputes resulting in a stoppage of work, as against 217,773 the previous year; while the aggregate duration in working days of the disputes was 2,162,151 in 1907, and 3,028,816 in 1906. The workpeople indirectly involved, it may be pointed out, are those thrown out of work at the establishments where the disputes occurred, though not themselves on strike or locked-out. Persons indirectly involved at other establishments are not included. The figures for last year, when compared with 1906, do not perhaps afford much cause for congratulation on the part of those who are striving to improve the relations existing between Capital and Labour; but they are, at any rate, a good deal better than those for ten years ago. In 1897, there were 864 disputes involving stoppage of work, 230,267 people were directly or indirectly involved, and the aggregate duration was 10,345,523 working days. As regards aggregate duration, which Mr. Wilson Fox points out is the best test of the amount of industrial disturbance, the 1907 figures were, with the exception of 1904, below those of any year for which the Labour Department have records.

The proportion of the total number of workpeople employed in the various industries who were involved in disputes last year was only 1·4 per cent., as compared with 2·2 per cent. in 1906. Taking the various industries separately, however, the proportions were, of course, different. As usual, we find coal mining coming first, with 5·4 per cent. of the workpeople being involved in disputes; and the textile trades next, with 3·9 per cent. For many years the coal mining industry has accounted for a greater number of workpeople involved in disputes than any other group of trades; but it is pleasing to note that the proportion is steadily falling. In 1907 the coal industry was responsible for 34 per cent. of all the workpeople involved in the disputes of the year, as compared with 51 per cent. in 1903. Taking the various trades, last year there were 22 disputes in the building trade, 112 in mining and quarrying, 134 in metal, engineering, and shipbuilding, and 153 in the textile industry. The numbers of workers directly and indirectly involved were (in the same order) 1230, 52,567, 19,576, and 47,429 respectively; and the aggregate duration of the disputes in working days was 23,128, 569,061, 467,633, and 642,460 respectively. The building trades, which for some years past have been remarkably free from disputes causing a stoppage of work, showed a further decline in 1907; the proportion of workpeople involved being no more than 0·1 per cent. In consequence of the absence of any general disputes, the number of persons employed in mining and quarrying who were involved in stoppages in 1907 was about two-thirds of that recorded in 1906. The majority of the disputes in this industry were not of a protracted character; and the aggregate duration was the lowest recorded since 1900. Mining and quarrying, however, still accounted for about one-fifth of the total number of disputes last year, rather more than one-third of the workpeople involved, and about one-fourth of the aggregate duration of all disputes. Compared with the previous year, there was a slight increase in the number of disputes recorded in the coal-mining industry; but the number of workpeople involved and the aggregate duration showed decreases of 39 and 33 per cent. respectively. Wages accounted for 41 of the 87 disputes, hours of labour for 2, and Trades Unionism for 15; but in the Trades Unionism questions there were 12,063 persons directly involved, out of the total for all disputes in the industry of 33,075. In all cases but one of refusal to work with non-Unionists, the strikers were successful in attaining their object; and when all the circumstances are considered, it seems surprising that there should have been even this solitary failure. Taking all the coal-mining disputes of the year together, and excluding disputes between Trades Unionists and non-Unionists, it appears that 31 per cent. of the workpeople were successful; while 30 per cent. were unsuccessful, and 38 per cent. arranged compromises.

The aggregate number of working days available in the year for the whole industrial population (exclusive of agricultural labourers and seamen) may be roughly estimated as being about 3000 millions; and the aggregate duration of the disputes in 1907 (2,162,151 working days) was less than one-thousandth of this total. Thus, spread over the entire industrial population (which, of course, it was not), the amount of working time lost owing to disputes in 1907 was less than a quarter of a day per head. In the coal-mining and textile industries, the average loss of time was about half a day per head of those employed. Most of the disputes were of short duration—no fewer than 243 out of the 601, or 40 per cent., having been ended within one week. These 243 disputes accounted for 47 per cent. of the total number of persons involved in the disputes of the year. The proportion of disputes lasting less than four weeks was 74 per cent., and of those lasting less than eight weeks 87 per cent. On the whole, the disputes were much less protracted than those of the previous year. The loss of working time through disputes in 1907 was greatest in the textile trades; the coal-mining industry coming next.

The death occurred recently, in his 79th year, of Alderman William Day, J.P., who for many years had been a conspicuous figure in the municipal life of Maidstone. He was for many years Auditor of the Water Company.

TECHNICAL METHODS OF CHEMICAL ANALYSIS.*

THE important work bearing the above title, of which a brief notice appeared in last week's "JOURNAL," p. 838, is intended to comprise three volumes, of which only the first is now published. It may be useful, however, at the outset to mention the scope of the whole work so far as it is likely to be of special interest to readers of the "JOURNAL." The first volume contains *inter alia* a section on "Technical Gas Analysis," by Professor F. Fischer, Ph.D., of Göttingen, translated and revised by Dr. Charles A. Keane; a section on "Fuel Analysis," by the same author, translated and revised by Dr. T. Lewis Bailey; a section on "The Manufacture of Sulphurous Acid, Nitric Acid, and Sulphuric Acid," by Professor G. Lunge, translated by Dr. J. T. Conroy, B.Sc.; a section on "Cyanogen Compounds," by Dr. H. Freudenberg, translated and revised by Dr. J. T. Conroy; a section on "Drinking Water and Water Supplies," by Professor L. W. Winkler, Ph.D., of Budapest, translated and revised by Dr. Gilbert J. Fowler; a short section on "Feed Water for Boilers and Water for Other Technical Purposes," by Professor G. Lunge; a section on "Sewage and Effluents," by Dr. E. Haselhoff, of Marburg, translated and revised by Dr. Gilbert J. Fowler; and a section on "Air" by Professor K. B. Lehmann, Ph.D., of Würzburg, translated and revised by Dr. Chas. A. Keane. The second volume, which has not yet appeared, is to contain sections on "Illuminating Gas and Ammonia" by Dr. O. Pfeiffer, of Magdeburg, with an appendix on "Ammoniacal Liquor" by Professor G. Lunge, translated and revised by Dr. Harold G. Colman, M.Sc.; a section on "Calcium Carbide and Acetylene," by Professor G. Lunge; and one on "Coal Tar" by Dr. H. Köhler, Ph.D., of Perth Amboy, U.S.A., translated and revised by Professor A. G. Green, M.Sc. The third volume, which is in preparation, is to contain a large number of sections, of which only those on "Mineral Oils," by Professor D. Holde, of Lichterfelde, translated and revised by Dr. J. Lewkowitsch, M.A., on "Lubricants," by the same author and translator, and on "Organic Dyestuffs," by Professor R. Gnehm, of Zürich, translated and revised by Professor A. G. Green, are likely to be of special interest to gas men.

It will be seen from the foregoing enumeration of the sections dealing with the methods of analysis applicable to industrial processes connected with gas and water supply, that the work would be a singularly comprehensive one, apart from the larger portion of its contents which primarily concerns other industries. Indeed, the mere comprehensiveness of the scheme of the work would have been to its disadvantage, but for the fact that the services of Professor G. Lunge, who is a pastmaster in the art of producing exhaustive technical treatises, have been secured as Editor. The list of his *collaborateurs* should also serve to inspire confidence in the work, as, for the most part, they are already well known as high authorities on their respective subjects. It is claimed in the preface to the work that, through the revision of the English translation by experts in this country, it has been thoroughly adapted to English conditions of manufacture. On the whole, so far as we can judge from the contents of the first volume, this claim is fairly justified. Incidentally, however, the publication of the treatise raises a doubt in our minds as to the utility of a work which covers such a wide field of technical operations. This doubt is strengthened by the collocation of the sections which, perhaps for sufficient but not obvious reasons, it has been thought proper to adopt. The enumeration of the chapters likely to be of interest to men engaged in one group of industries—viz., those connected with gas and water supply—which was made above, indicates that the matter relating thereto is scattered through the three volumes of the work. In other words, the arrangement of the work is not well adapted for the requirements of the analytical specialist, since, in order to secure the information relating to the branches of technical analysis in which he is interested, he will have to take with it a considerable burden of equally valuable, but to him relatively useless, matter. It seems to us that had the interests of the technical and the industrial analysts been put in the foreground, the sections would have been grouped together in such a way that the information which any one such specialist will ordinarily require would have been found in a single volume of the work. The technical analyst whose scope traverses a wider range of subjects than could conveniently have been grouped together in one of these volumes is a *rara avis* among his brethren. We make this suggestion in no carping spirit, but in the hope merely that in a subsequent edition of the work the publishers and editor may give to it their timely consideration.

Passing on to the contents of the present volume (which is bound in two parts), we may at once say that they consitute a compilation of unusually high merit. It is a pleasure in these days, when slipshod technical literature appears to be in the ascendant, to turn to a work of the calibre of that now before us. The comments we shall have to offer on various points in the sections with which, from the point of view of the readers of the "JOURNAL," we are more particularly concerned will throughout be of the nature of friendly suggestions to the editor and his contributors.

In the first place, the proof reader should have looked more carefully over the list of titles of journals on which the contributors have drawn for information; for our German contemporary the "Journal für Gasbeleuchtung and Wasserversorgung" has the latter part of its title changed to "Wasserbesorgung;" while the "Chemiker Zeitung Repertorium" acquires an extra syllable and becomes for the nonce "Repertitorium."

The opening section of the work, by Professor G. Lunge, is on "General Methods Used in Technical Analysis." And it is obvious that the distinguished author found it somewhat difficult to decide what limitations he should set to his treatment of this comprehensive theme. In all, he devotes 186 pages to it. After a few introductory remarks, he passes on to the sampling of materials and products. So far as the taking of samples of solids and liquids is concerned, the directions are admirable, and the sampling of gases is deferred to a special section. The general laboratory operations are next dealt with adequately, and it is plain that here the editor has had, for the sake of conciseness, to say less on many points than he would have desired. Obviously, however, the subject is one which may be more fully dealt with appropriately in a text book on analytical chemistry in general. A good deal is said with reference to the reading of burettes and the use of floats, circular graduations, magnifying glasses, and screens for avoiding parallax and attaining a sharp reading. No mention, however, is made of the valuable and convenient adjustable magnifiers ordinarily used for making precise readings of thermometer scales (as, for instance, in calorimetry), which are preferable for burette reading to many of the devices named. Indicators are treated fully and well; but we think due justice is not done to the merits of tincture of cochineal and turmeric papers, which for various analytical and testing operations on gas-works are superior to other indicators. The preparation of standard solutions is satisfactorily dealt with; but in the general remarks on volumetric analysis it is said that colour changes are generally less distinct in artificial light than in daylight—yellow light being particularly objectionable in this respect. But it is added that incandescent gas light and electric light are nearly as good as daylight, after some experience has been gained with these illuminants. We think most analysts will agree that the average electric glow lamp gives too yellow a light for the satisfactory detection of colour changes, and that only when much overrun or exchanged for an osram or metallic filament lamp can the analyst proceed comfortably with volumetric work.

In connection with gas volumetric analysis, methods are given for the estimation of the carbonic acid evolved from carbonates depending on the determination of that gas by volume. The forms of apparatus for the determination of the carbonic acid by loss in weight are rightly said never to give accurate results, and they are properly excluded. But the carbonate in spent or reburnt gas-lime could not be satisfactorily determined by any of the methods described, and it would have been well to have given a properly arranged gravimetric absorption method of estimating the carbonic acid from carbonates, as it is more generally applicable, and in many cases more trustworthy than the volumetric methods. The determination of the specific gravity of liquids is handled pretty thoroughly; but the curious statement is made that hydrometers which indicate the specific gravity directly are practically never used in works for specific gravities above 1·0. Such hydrometers are certainly common enough in many works in this country, whatever may be the case on the Continent, in respect of which presumably the statement was penned. As to the measurement of pressure and draught in flues and mains, no mention is made of Professor R. Threlfall's excellent work, of which he gave an account before the London Section of the Society of Chemical Industry in March last year.

The second section of the volume is that dealing with "Technical Gas Analysis" by Professor F. Fischer, Ph.D., of Göttingen, already referred to. The special methods employed in connection with the manufacture of illuminating gas will, it is said, be described under the section dealing with that subject (to be included in Vol. II. of the work); but there is a good deal in the present section directly connected therewith. In the directions for sampling furnace and flue gases, a necessary caution is given against the employment of iron collecting tubes (which, when hot, absorb oxygen freely); but the convenient and trustworthy fused quartz tubes now so readily obtainable are not named as a substitute. Further, no mention is made of narrow mouthed stoppered bottles for the collection and storage of samples of gas, whereas they are far more convenient in a majority of cases than the more costly and relatively fragile long tubes with stop-cocks. A 2 oz. or 4 oz. bottle, with well-ground stopper lightly greased with vaseline, is absolutely free from risk of leakage, even if the sample is stored in it for months; while when required it is readily opened under mercury (or water) in a pneumatic trough and the necessary volume withdrawn into the burette of the analytical apparatus.

The gas burette devised by Professor H. Bunte is described as Bunté's burette; the translator evidently being under a misapprehension as to the nationality of the distinguished Professor. There is a caution introduced from the text-book by Sir C. Le Neve Foster and Dr. J. S. Haldane on "The Examination of Mine Air" with reference to the possibility of errors arising through the absorption or production of carbonic acid by dirt

* "Technical Methods of Chemical Analysis"; Edited by George Lunge, Ph.D., Dr.Ing., Emeritus Professor of Technical Chemistry, Federal Polytechnic School, Zürich. English translation, from the latest German Edition, adapted to English Conditions of Manufacture. Edited by Chas. Alexander Keane, D.Sc., Ph.D., Principal and Head of the Chemistry Department of the Sir John Cass Technical Institute, London. Vol. I. London, Gurney and Jackson; 1908.

which may be present in the containing vessel. Applied as it is here to the Bunte burette, the caution becomes an absurdity; for the quantities of carbonic acid so absorbed or produced are so small that they can be detected only in the delicate apparatus specially devised for the analysis of air. The Bunte burette would be perfectly useless for the estimation of the proportion of carbonic acid in air. This and other curious slips in this section have shaken our confidence in its value, as they indicate that practical acquaintance with some of the apparatus and methods referred to has been lacked by its compilers. Later on a very inconvenient arrangement is described for combustions over a glowing platinum wire; and pyrogallol solution for the absorption of oxygen prepared according to the directions given, could well be improved upon. The calorific value of gaseous fuel is dealt with in this section. The Junkers and Boys calorimeters are described; but no attempt is made to compare their respective merits, evidently for want of practical acquaintance with one or both of the instruments.

The next section is on "Fuel Analysis." The analysis of coal and coke is rather too cursorily handled, and sufficient importance is not attached to the methods proposed by the last Committee of the American Chemical Society which reported on the subject. These seem likely to be accepted as the standard methods in England, Switzerland, and other European countries as well as in America, yet some of them are either omitted altogether or are inadequately described in this section. Chapman's work on the estimation of arsenic in coke is not even mentioned; and the reader is referred to the original papers for the description of other analysts' methods of estimating arsenic in coal and coke. One trustworthy method should certainly have been included in the text of this section.

The next section, on the "Manufacture of Sulphurous Acid, Nitric Acid, and Sulphuric Acid," is excellently written, and may be warmly commended to the attention of those interested in these processes. Then follow sections on Saltcake and Hydrochloric Acid, Sodium Carbonate, and the Chlorine Industry, all likewise by Professor G. Lunge himself. To gas men, the only matter of any direct interest in these sections will be the analysis of Weldon mud. These sections conclude the first part of the volume; and it will be convenient to hold over until next week our comments on the second part.

DOINGS OF AMERICAN GAS ASSOCIATIONS.

[COMMUNICATED.]

IN a June issue of the "JOURNAL," mention was made of the future Convention of the National Commercial Gas Association and of the exhibition of gas-using appliances to be held in connection with it. The dates of meeting are Dec. 8, 9, and 10; and the First Regiment Armory in Chicago will house the Convention and its exhibits. These are expected to exceed in number and attractiveness any similar exhibition ever held in America; and the Committee of Arrangements, representing the American Gas Institute as well as the Commercial Association, have striven in every way to smooth the path of the exhibitor. The price to be charged for space covers every expense the exhibitor will be put to, from the time his exhibit reaches Chicago until it is placed on a homeward train properly boxed at the close of the Convention. All the work in this connection will be done by the Committee; and the exhibitor's only care need be as to his own person. The area available for exhibits is over 22,500 square feet. The various State Gas Associations in the territory adjoining Chicago are evincing much interest in the exhibition, and the hundreds of thousands of gas consumers in Chicago and outlying towns will be supplied with free tickets of admission by their respective gas companies; so that there is no doubt of a large attendance, not only of gas men, but of the general public.

Prior to this Chicago meeting, and of more importance, especially to the gas engineer as distinguished from the commercial man, occurs the meeting of the American Gas Institute on Oct. 21, 22, and 23. It is quite probable that the attendance will be the largest ever recorded at any Gas Association meeting. This for a variety of reasons: First, a good meeting is expected from the present officers; second, every one likes to go to New York City; third, there will be a chance to visit the magnificent Astoria plant under the most favourable of circumstances; fourth, the Institute is steadily growing in membership—the increase this year exceeding one hundred; fifth, the uncertainty as to nominations for next year's officers, resulting from the failure last year to promote the Vice-Presidents, lends an exciting interest to election matters this year, and some friends of possible nominees may come to vote, if not to listen to papers.

Of course, of the above reasons the first is the one that really influences the member who comes determined to attend faithfully every session, to learn all he can, and share with others any knowledge he may believe of value to them. Those who are in close touch with the Technical Committee of the Institute believe the meeting programme and results will amply justify the organization adopted last year, by which a Committee of strong *personnel* was made responsible for the technical work of the Institute. No official announcement of the technical fare to be provided has as yet been made. It is generally known, however, that various Sub-Committees of the Technical Committee have been hard at work this past year, with results already apparent in some instances. Such are the Sub-Committees on units of light, calorimetry, and uniform accounting. The first has been the chief factor in obtaining an agreement between the gas and electric interests of the country, upon a definite value for the unit of light—an agreement so worded that an international agreement on the question is also in sight. The second has been influential in the conclusions of the Wisconsin Commission upon the proper heating value of gas, and will also present the results of some very careful tests with different calorimeters. The third has laboured with the New York Commission to ensure that the forthcoming compulsory system of accounts (soon to be announced by it for the gas companies under its jurisdiction) would be acceptable to, and workable by, these companies. So in these three ways, the Technical Committee acting for the Institute has been working for the interests of its members, and demonstrating the advantages of organized effort.

Another Sub-Committee—that on pipe standards—is expected to present a set of standard dimensions for cast-iron pipes and specials that will correct in certain details, and also amplify, the standards that were adopted by the American Gaslight Association in 1898, but which have never come into very general use.

An additional field of work of the Technical Committee, through which it has during the year been steadily furnishing illuminating answers to a score or more of questions, is the Bureau of Information—a Committee of twelve members. The answers are being published in the gas periodicals, and bear the stamp of authority and knowledge. They will add appreciably to the value of the next volume of the Institute's proceedings.

It is needless to say that the Technical Committee has been hard at work during the whole year, and that, as is often and perhaps properly the case, the brunt of the effort has been borne by the Chairman, who this year is Mr. W. H. Gartley. However, if it becomes an unwritten law that one year's service as Chairman would mean, after due time, the presidency of the Institute, and if the Chairman has always had previous service on the Committee, then, unless ambition and altruism do not exist among us, there should be enough material always available to maintain the work of the Institute at a high standard. The remark has been made that a clique is in charge, and no one not in favour with it need expect to be recognized. A sufficient answer to this is that the controlling factors in the Institute are the men who have written the papers, and done the work of our Gas Associations for the last decade, and that during this time practically all papers offered have been accepted. As criticism is much easier than performance, there will always be those who think they would work if they could be assured of proper recognition. Of course, such men do not become leaders in their profession.

RELATIVE COST OF GAS AND OTHER MODERN METHODS OF LIGHTING.

A RECENT number of the "Zeitschrift des Vereines des Gas-und Wasserfachmänner in Oesterreich-Ungarn" contains an article by Herr Alfons Seereiner, the Manager of the Gas-Works at Szabadka (Maria-Theresiopel) in Hungary, recording the results of an investigation into the relative duty of modern electric lamps, gas-lights, and a few other sources of light. He concludes with some summaries of the comparative cost of the several methods of lighting for three different degrees of illumination—viz., when the illuminating power is about (1) 50 hefners (45½ candles), (2) 500 hefners (455 candles), and (3) 1000 hefners (910 candles). The appended table gives the relative values for the cost of lights of these intensities on the basis of the prices named for energy, gas, and raw materials, taking the cost of light from the ordinary incandescent gas-burner as unity.

Description of Light.	Price of Material.	Relative Cost of Light.		
		45½ Candles Intensity.	455 Candles Intensity.	910 Candles Intensity.
Incandescent gas-light—				
Ordinary	5s. 8d. per 1000 c. ft.	1	1	1
Inverted	,, ,, ,,	..	..	0·77
High-pressure	,, ,, ,,	..	..	0·85
"Selas" compressed air ordinary incandescent gas-light	,, ,, ,,	..	..	0·58
Do. inverted gas-light	,, ,, ,,	..	..	0 50
Air-gas incandescent light	2¾d. per lb. (gasoline)	1 3	..	..
Electric flame arc light	6d. per unit	..	..	1·15
,, tungsten glow lamp	,,	2·5	2·0	1·90
Acetylene	1·09d. per lb. (carbide)	2·2	3·0	..
"Blaugas" incandescent light	6·5d. per lb.	2·4	2·0	..

The late Mr. H. W. Tyrwhitt Drake, the Chairman of the Maidstone Water Company, whose death, at the age of 62, was recorded in the "JOURNAL" for Aug. 18, left estate valued at £47,100 gross, with net personalty amounting to £33,205.

NEW PHOTOMETERS AND A CALORIMETER.

THE Electrical Exhibition at Manchester opened last Saturday; and, apart from the general interest that will attach to the exhibition for our readers, there will be a few of the exhibits that will have special interest for them. More particularly so will be certain of the productions on view at the stand of Messrs. Alexander Wright and Co., Limited, some of which we were enabled to see prior to their transfer to Manchester. Need our readers be told that the firm are specialists?—specialists in apparatus of all sorts and conditions that brings Science, by practical and simple means, to the aid and protection of those engaged in industrial work. Their productions are devised and manufactured with scientific precision for scientific application; and the precision seems to be accentuated in the very finish of the goods. Such thoughts occur as the exhibits are inspected that have now been installed in the Manchester Exhibition.

There were three special objects of interest upon which attention was concentrated on a visit to the works of the firm the week before last. The first is a photometer designed for the National Physical Laboratory; the second, a portable photometer; and the third, a calorimeter which can also be carried about at will, and be used practically anywhere. The diverse uses of the two latter will attract consideration; and the first named will similarly court notice on account of the refinement embodied in it, and its ready adaptability to many purposes.

THE NATIONAL PHYSICAL LABORATORY NEW PHOTOMETER.

This photometer first claims notice; and the origin of this particular form may be related. It will be remembered that the Engineering Standards Committee framed a specification for carbon filament electric lamps; and a lamp complying with this specification is to be called a "British standard lamp"—not, of course, meaning a standard of light, but a lamp that has passed the prescribed test photometrically. It was left to the National Physical Laboratory to provide the necessary photometrical appliances. At the Laboratory, there has been a bench of the Reichsanstalt pattern; but the authorities there put into Messrs. Alexander Wright and Co.'s hands the designing of a bench to carry out the tests as prescribed by the standard lamp specification—incorporating a lamp-rotator designed by Mr. C. C. Paterson, whose photometrical work at the Laboratory has been frequently referred to in our columns. Therefore the photometer now described may be taken as being the one that the National Physical Laboratory has adopted; and we do not think there is any breach of confidence in saying that the authorities there consider the bench and its equipment as comprising a photometer far in advance of anything that has yet been produced in this direction. Anyway, the description and illustration will, we are sure, interest all who have concern in precise photometry.

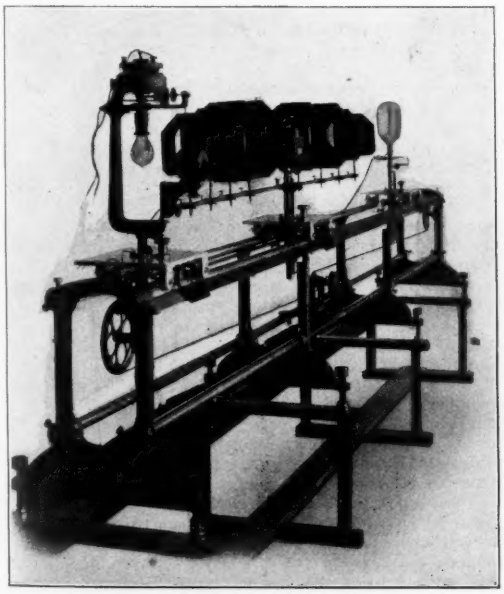


Fig. 1.—The National Physical Laboratory Photometer.

Looking at the illustration, the description of the parts will be the better followed. The bench itself is a highly finished piece of metal work. It is formed of two turned and planished steel bars, some 12 feet long by 1¼ inches outside diameter, supported on four heavy cast-iron standards, which take the carriage run and also two tubular tie-rods. The carriage run or surface is absolutely perfect as regards plane and span; and, on all hands, there are found means of adjustment so as to maintain perfection under any circumstances. We like the form and situation of the reading scale. It consists of a strip of triangular brass, having an inclined face of 1¼ inches, and is situated in front close up to the carriage run. The polished face has engraved upon it two scales—one showing candles, and being direct reading without calculation; the other a check scale in millimetres—the total length of graduation being 3 metres. The graduations on the scale are set out for the use of the "substitution method"—that is to say, the lamp under test is presented to the same side of the photometer head as was the primary standard used for verifying the working standard. Thus all errors of apparatus and reading bias inherent to the sight of the operator are avoided. A further point is that the "1" on the candle scale is 1 metre from the zero of the scale; and the photometer head is placed centrally with the "1," and the primary standard is central with zero, when the working standard is calibrated.

Before leaving the scale we are attracted by the novel arrangement for reading it, by which perfect accuracy is secured. It consists of the attachment to each carriage of a brass frame on swivel joints, so that the frame always sits flat upon the scale, which it will be observed is upon the angle face of the three-sided metal rod. In each of these three frames, there is fitted a piece of plate glass, and on each a line is scratched on the underside central with the vertical centre of each carriage. It will be seen that the mark upon the glass is in absolute contact with the scale; and thus all reading errors are avoided.

Turning from the structural part of the bench to its fittings. The working standard is clamped to the photometer head at the distance at which equality is observed; so that it will be seen that in all tests the illumination on both sides of the photometer head (when this shows equality) is constantly equal to 10-candle metres. The electric lamp is revolved at a speed equalling 200 revolutions per minute (by Paterson's rotator) about a vertical

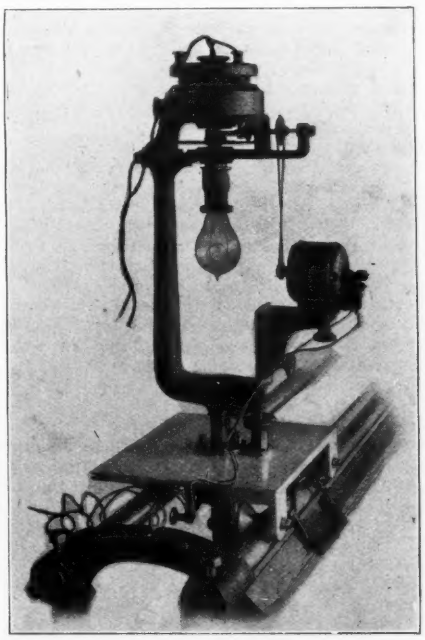


Fig. 2.—Paterson's Lamp Rotator.

axis coinciding with the axis of the lamp; the centre of illumination of the filament being in line with the axis of the photometer. This rotator of Mr. Paterson is of the mercury bath type, and is arranged to revolve lamps suspended vertically at a speed varying from 400 to 30 revolutions per minute. That it is handy may be gathered from the fact that it is made to drop into the central tube of the photometer carriage, and that the total dimensions are 417 mm. high by 266 mm. outside width (including motor). The construction is such that, owing to the mercury bath and amalgamated copper terminals, there is practically no drop in the voltage, nor between the rotator and the volt-meter. The motor is self-starting, and runs at (approximate) speeds of 1000 revolutions per minute at 4 volts and of 1600 revolutions per minute at 6 volts. The drive to the lamp spindle is by friction.

The carriage bearing the working standard lamp is coupled to the carriage for the photometer head, and is clamped to it; and, these being moved together, the candle power of the lamp under test (which is revolving) is read directly off the scale in the position at which the photometer head was arrested when equality of illumination was observed. Briefly, this method—on which the National Physical Laboratory place some importance—ensures: (*a*) Rapidity of tests. (*b*) Direct reading in candles. (*c*) Facility for checking results. (*d*) Elimination of apparatus and personal errors. (*e*) Standard illumination of 10 candle-metres.

Three carriages are provided upon aluminium tables or saddles, fitted with wheels made of hard metal and bevelled so as to sit on the bench without any rock whatever, and at the same time without any tendency to stick. The central tube may be said to

consist of three parts—a main or guide tube, a central sliding tube, and a short inner tube, for the reception of the lamp socket, &c. The main tube is fitted below each carriage; and upon it is clamped actuating mechanism of well-fitting rack-and-pinion motion for actuating the central sliding tube. This has an inner tube at its upper end, which carries a circular plate divided into 360 on its periphery; while on the sliding tube is fitted an arm carrying a pointer for indicating the degree. Into the inner tube, the standard lamp socket fits, being secured by a keyed way; and as the divided plate thus moves when the lamp is turned, the axial angle of the lamp is indicated in a very clear manner. The rack-and-pinion mechanism actuating the central sliding tube, and enabling perfect alignment to be obtained, can be fixed by means of a separate clamp.

Each carrier has a coupling nut, a turn of which fastens it firmly to the bench without any side movement. It is an essential part of this photometer that any two of the carriages can be coupled together and moved by a convenient arrangement, or that any one carriage can be similarly moved so that a person observing the photometer head can cause a carriage or carriages to travel along the bar without disturbing his observation by shifting from his place. The arrangements for doing this consist of a coupling piece attached to the underside of each carrier, and provided with an orifice through which can be passed a rod at a plane parallel to the plane of the photometer-bench. Any of the carriages can thus be coupled together at any distance apart; while any of them, either singly or coupled, can be instantly attached to an endless steel cord, which passes over two large wheels at both extremities of the bench, and is actuated by a winch, so made that it can be clamped at any part of the lower rails of the bench. A simple device is seen to be fitted to the endless steel cord, by which slack can be taken up. The carriages instantly answer any movement of the winch, and travel with perfect ease and smoothness. The whole of these arrangements for fixing, or moving or coupling together, and then moving any of the carriages while the operator is standing or seated (as the case may be) at any portion of the bench, are instantaneous in action. The accuracy of alignment, perfection of travel, and ease of manipulation are peculiarly interesting features to the investigator of the merits of this photometer.

This completes the description of the photometer that has been designed for the standard work of the National Physical Laboratory. It will be readily recognized that the photometer can be adapted to all forms of high-class photometrical work. Of course, for gas or gas-lamp testing the primary standard—the Harcourt ten-candle pentane lamp—can be maintained in use; and the secondary standards and lamp rotator need not form part of the equipment. Furthermore, a bench in simplified form, but preserving the essential features of the one described, can be produced. But what has been described is, in principles and structure, the high-class standard adopted by the firm for this line of photometer; and, to say nothing more about it, it is really a fine piece of work.

Direct-Reading Portable Photometer.

Passing from the instrument in which so much interest has been found, we turn to a small direct-reading portable photometer, which, investigation shows, can be applied to multifarious

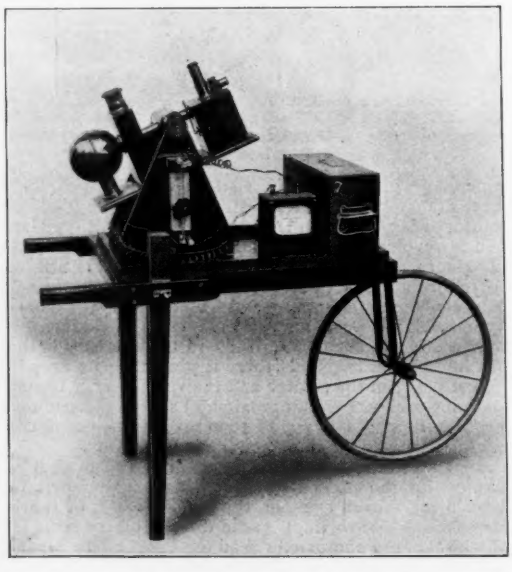


Fig. 3.—The Simmance-Abady Electric Street Photometer, Mounted for Street Use.

purposes—such as the testing *in situ* of street lamps, railway carriage lamps, and the lights employed in large interiors. Not only is it a measurer of illuminating power, but it can be employed as a comparative tester of illuminating effect under any similar set of conditions. It is quite a small photometer—so small that it can be carried about or run on a little wheeled carriage. Although quite a simple structure, it is not a particularly easy matter to describe it in comprehensible form. However, consulting the photographic representation, a start may be made at the ball-like portion of the instrument. This is a hollow sphere; and on the inside it is coated with barium sulphate. At the bottom of the sphere there is a tube; and in this tube is placed a little metallic filament electric lamp, so that the whole of the interior of the sphere is equally illuminated. Instead of working direct off this lamp, a portion only of the interior illuminated surface of the sphere is taken. In front of the sphere, there is an opening, which can be wholly or partially opened or closed by a pair of adjustable shutters. Fully open, the aperture only measures 15 mm. In connection with the metallic filament lamp, which is run off a 10-volt cell, there is a fine-reading volt-meter and a sensitive rheostat. When the

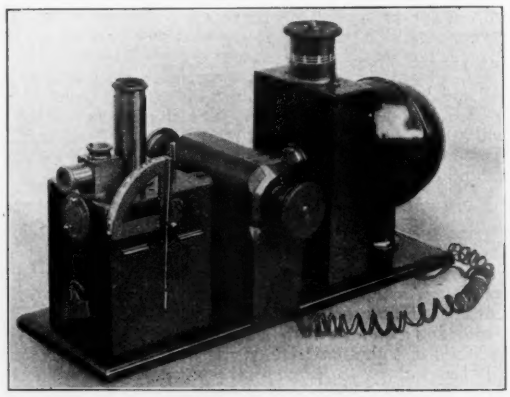


Fig. 4.—The Simmance-Abady Electric Street Photometer, as Used for Ascertaining Aggregate Illuminating Effect.

aperture in the sphere is fully open, and the voltage of the lamp is adjusted, the light from the illuminated interior is equal to 3 candles. A drum, which is divided into a scale of 300 parts, actuates the shutter. Knowing the voltage that gives 3 candles when the shutter is fully open, all that has to be done when making a test, while observing the photometer head, is to open or close the shutters until equality is obtained on a flicker; and then the candle power in foot-candles is read off the scale on the drum. If it stops at 100, then the operator knows it is 1 foot-candle; but readings can be made as low as 0·003 foot-candles. The photometer is fitted with an angle finder, which makes its own artificial horizon. Having located the light, the flicker photometer is wound up and started. Equality obtained, the reading is made, as already explained, direct in foot-candles. That is briefly the whole equipment and method of operation. The photometer can be carried about (with or without the carriage) just where and when one pleases, and a test made and readings taken precisely at the operator's discretion. A small portable instrument such as this will be very useful for comparative work, in the increased and increasing rivalry of gas and electricity.

Portable Gas Calorimeter.

Here we have another instrument that will also be of considerable value. It is one of those triumphs of ingenuity of which many samples are seen about the shops of Messrs. Alex. Wright and Co., and with which the names of Mr. John F. Simmance and Mr. Jacques Abady are intimately associated as inventors and designers. This is a portable gas calorimeter; and it is primarily designed to enable people to readily test the calorific power of suction gas, and to ascertain more about the uniformity or otherwise of the production, which reflects itself in the uniformity or otherwise of the mechanical efficiency of the engine. Claims are made for calorific power in connection with these suction plants to which some suspicion attaches; hence the demand for a simple form of calorimeter that can be applied for this special purpose. But let us say at once that the range of usefulness is not limited to this particular work; but interesting studies can be made anywhere in a district of supply of the calorific value of town's gas. It is one of those instruments that will not be long in carving out an extended field of usefulness for itself. However, in a suction plant the gas does not flow in the connecting-pipe between the producer and the engine under the same conditions as exist in the case of a pipe coupling up town gas to an engine. The town gas is flowing at a pressure; while in the suction-gas plant, the gas connecting-pipe is really under vacuum—the gas being merely sucked along by the engine as required. If, therefore, one wants to determine the calorific power of gas going to an engine from a suction producer, and simply takes a small pipe off the main, nothing will flow through. This being so, an ordinary calorimeter cannot be employed, without having recourse to a holder, and drawing off the gas artificially by a pump. This, of course, would mean an elaborate equipment.

Now what the firm have done in this new portable instrument is to adopt a little aspirator, which is filled with water, and can be

conveniently carried about anywhere. This aspirator is accommodated on a small stand, which also carries a gas container fitted with a gauge. A charge of the suction gas is drawn into the container by lowering the aspirator to a lower level; and this action overcomes the exhaust of the engine. Having obtained a charge of gas, the cock on the connecting-pipe is closed; and the aspirator is put back in its place. The calorimeter is on a separate small wooden stand. It comprises a specially designed double jacketted copper vessel, nickeled on the outside. In this vessel a litre of water is placed. By means of a thermometer on the top, the temperature of the cold water, after being shaken up, is first taken. The indiarubber tube gas connections are then linked up; and then by raising the aspirator to a higher shelf on the stand, gas is sent from the container, and is consumed at the burner under the calorimeter. On the gas container, there is a pressure equalizing arrangement and gauge; and this is calibrated so as always to have a fixed content after the pressure has been equalized. The water rises up the gauge tube; and as it passes the mark to which it has been set, the burner being alight, is placed under the calorimeter. The gas goes on burning until it shuts itself out; the same quantity of gas—about $\frac{1}{20}$ cubic

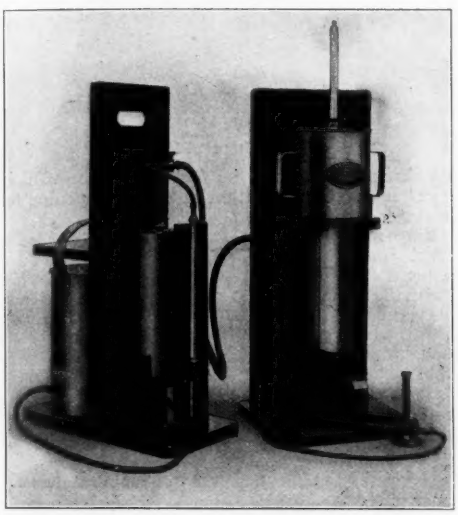


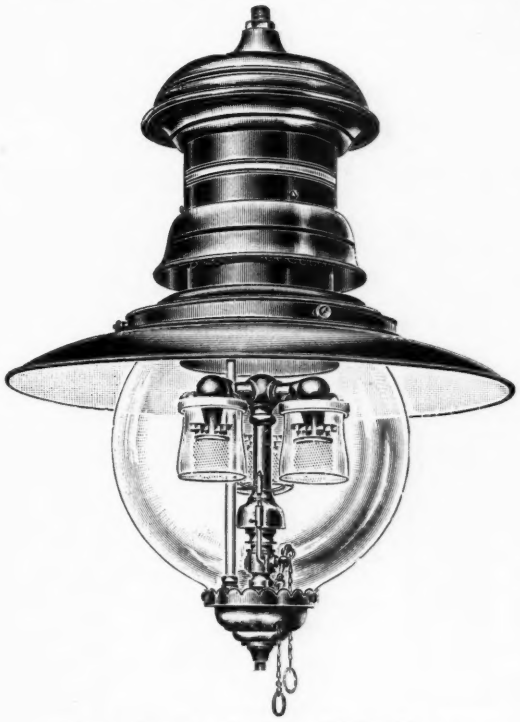
Fig. 5.—The Simmance-Abady Portable Calorimeter.

foot—being used if no mistake is made by going above the mark. The gas having imparted its heat to the litre of water, the vessel is shaken, and then the rise of temperature is read off the thermometer. One has simply to multiply the rise in the thermometer by the water value of the instrument, and this gives the calories per cubic foot of gas. That is the whole thing; it is well constructed, and in method beautifully simple. Positive exactitude is not claimed for the instrument. Numerous tests, however, have been made; and the calorific power results came out in successive trials to within 2 per cent. Therefore it may be taken that approximate results can be relied upon.

By the way, alluding to the recent paper by Dr. Glazebrook on determinations of the humidity of the atmosphere (see "JOURNAL" for Sept. 15, p. 713, and Sept. 22, p. 766), Messrs. Wright and Co. inform us that they are in the position to make instruments for such determinations, and that there is not the slightest difficulty in turning out a reliable one.

NEW INTENSIVE CLUSTER LAMPS.

FROM experience when inspecting the London show-rooms devoted to the display of modern gas-fittings, we are convinced that the temptation and bewilderment which overcome one on visiting the places where such goods are to be seen must be equal to that which it is generally supposed women feel on going into a well-stocked milliner's establishment. Wandering round, the purchaser has no difficulty in making a first choice; but on proceeding a few steps farther, this first favourite is discarded for another—and so on, until the feeling creeps over one that nothing short of the purchase of about half the entire stock will be satisfactory. Indeed, the gas consumer on visiting a show-room is likely to be in the greater trouble of the two; for whereas the fair buyer of a hat will probably allow fashion to be the governing factor, the person who goes out seeking gas-fittings will be guided purely by his own inclinations. He will find goods to suit all tastes; and thus the whole thing sounds simple enough. But the difficulty arises over the fact that there are not only styles to suit all tastes, but numberless ones to appeal to each individual taste. One day last week a visit was paid to the new show-room of Messrs. J. & W. B. Smith, in Farringdon Road, and an effort made to decide which was the handsomest of the hundreds of gas-fittings to be seen there. But the final conclusion come to was that there were dozens which equally deserved this title—in all kinds of shapes, and of various materials. From this, it will be judged that the firm have a full stock of the very latest and best patterns—a remark which does not apply to fittings alone, but also to globes, &c., in regard to which (having their own works



The "Comet" Upright Inverted Cluster Lamp.

for cutting and otherwise dealing with glass) they are in an exceptionally favourable position.

The stroll round the show-room, however, was merely by way of recreation; the real object of the visit being to make acquaintance with the firm's new "Comet" and "Silva" intensive inverted cluster lamps. The former is a wind and rain proof outdoor lamp; and the latter is made in two styles, for inside and outside purposes. A special feature in connection with all three patterns

New "Silva" Indoor Lamp.

is that they are provided with inner glass cylinders to the burners; and for the outside lamps a lighting capacity of about 125-candle power per burner, with a consumption of about 4 cubic feet per hour, is claimed. The indoor "Silva," it is said, consumes some 11 cubic feet of gas per hour, and has a lighting capacity of about

300 candles. It is a three-burner self-intensifying regenerative lamp, fitted with flash bye-pass and gas-adjusters, as well as a separate control tap with chains to each burner. Thus one, two, or three lights can be used as desired. In appearance it is strikingly handsome; being finished in white vitrified enamel. To return to the two outdoor lamps, it may be remarked that they are both strong and well made, and that they can be had with either two or three burners. They are also fitted with gas-adjusters. In addition, the "Comet" lamp is provided with Messrs. Smith's new upright inverted cluster—an arrangement which, after making exhaustive tests, they feel confident will give complete satisfaction.

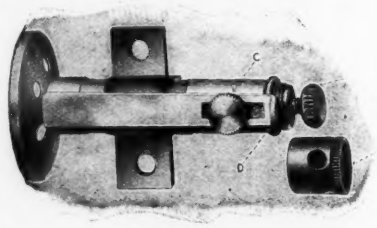
PARKINSON STOVE COMPANY'S NEW GOODS.

PROMINENT among the new features introduced by the Parkinson Stove Company Limited, for the coming season is the new pattern fuel — Parkinson's "Intense" pillar fuel—shown in the accompanying illustration. There is no doubt the question of a suitable fuel—suitable in regard to shape and substance—has a very important bearing on the question of gas-fires becoming more popular; and this Company have for several years given a great deal of attention to the subject. Last year, it will be remembered, their registered design tubular pattern fuel was introduced, the chief feature in this being that points were projected inwards to meet the flame. A hot fire was thus very quickly obtained with the minimum gas consumption. This fuel was pronounced by the gas profession generally to be a step in the right direction. This year, however, the improvements are being taken a further stage; and the fuel illustrated has been introduced, in connection with the freshly-designed fuel-guard seen on the new pattern fire shown in the second illustration. The pillar fuel referred to, it will be noticed, has points projected inwards; and it is made of a material of a highly refractory nature, which can be brought to a state of incandescence quickly. The system thus introduced is confidently asserted to be the most economical and efficient yet devised; the maximum amount of heat with the minimum gas consumption being obtained. Where desired, this pillar fuel and fuel-guard can be supplied to the other designs in single row of fuel-fires made by the firm.

Parkinson's "Intense" Pillar Fuel.

New designs in gas-fires are also included—the "Onyx" and "Beryl." These are attractive and inexpensive designs, specially suited for hiring-out, and will be found very powerful heaters. The "Onyx" is constructed with a 13-inch fire opening to give a larger heating surface in the single row of fuel series. Both patterns are supplied with the improved gas and air adjuster, with which such good results have hitherto been obtained.

The "Onyx" Fire.



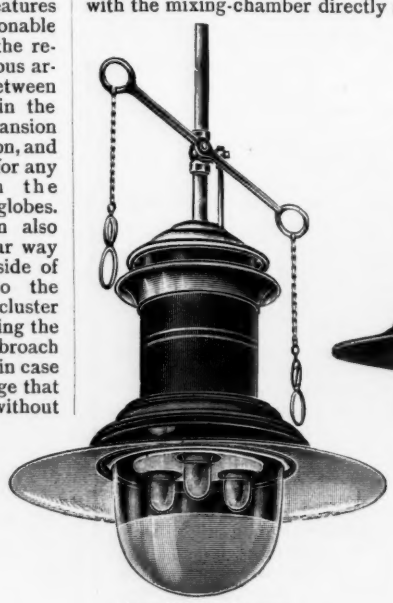
Improved Gas and Air Adjuster.

Gas-heated steam-radiators, plain design, in both single and double column, have been added to the radiator section, making a very complete series. These are also supplied with the gas and air adjuster alluded to; and, when required, for certain positions, a flue outlet can be fitted.

POND AND CO.'S NEW SEASON'S LAMPS.

THIS enterprising firm have again several specialities for the present season in the way of high-power inverted lamps for both indoor and outdoor lighting. The outdoor "Pilot" lamp shown in the illustration is supplied with three or four patent upright inverted cluster burners. It may be remarked that Messrs. Pond and Co. fitted a number of these lamps at the Franco-British Exhibition; and they have been giving an excellent account of themselves since the opening day. Some of the special features to which attention may be directed are its extremely reasonable price; the screw syphon provided at the lowest point for the removal of any condensation or stoppage; and the ingenious arrangement of a double sliding ring which makes the joint between the globe and lamp-head—giving full play to the globe in the matter of expansion and contraction, and also allowing for any difference in the length of the globes. The syphon also affords a clear way from the outside of the lamp to the nipple of the cluster burner, allowing the passing of a broach to the nipple, in case of any stoppage that may occur, without the necessity of removing the globe. The bayonet-catch support at the bottom of the globe is simplicity itself; and this, in conjunction with the double ring referred to above, reduces to a minimum the possibility of the globe breaking. Another point worthy of mention is that every part of the "Pilot" lamp is British made. Two other good inverted lamps made by the firm are shown. These are the "Tulip" (for outdoor use) and the "Corona" (for indoors), both constructed on the lines of somewhat similar lamps which have well proved their efficiency, and have no superiors in lamps of the class in which each burner has a separate nipple, with the mixing-chamber directly above the mantle.

The "Corona" Lamp.
(Indoor)



The "Tulip" Lamp.
(Outdoor)

The "Pilot" Lamp.
(Outdoor

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting at Stockton-on-Tees.

The members of the above-named Association, to the number of upwards of a hundred, assembled at Stockton-on-Tees on Saturday, for their 63rd half-yearly general meeting. On arriving by train, they proceeded to the gas-works, where, just before noon, they were received by Mr. William Ford, the Gas Engineer of the Corporation, the President of the Association, with whom were Alderman John Harrison, J.P., the Chairman of the Gas Committee, and other members of the Committee.

Inspection of the Works.

Mr. Matt. Dunn, the Assistant-Manager at Stockton, at once took charge of the members and conducted them round the works. In the first place they inspected the laboratory and the various workshops; afterwards visiting the sulphate of ammonia house and examining the plant there. One of the small, but interesting, features of this plant was the sack-holder recently invented by Mr. Dunn, and described in the "Journal" for the 22nd ult. (p. 780), for facilitating the filling of bags with sulphate. The ingenuity, simplicity, and effectiveness of the contrivance were very much admired. Outside the house the visitors saw that the Claus plant had been abandoned; and Mr. Dunn explained that the frequent leakages from the joints had a detrimental effect upon the health of the men. In place of this plant, the Corporation have adopted the heap oxide of iron purifiers for dealing with the noxious fumes. This plan was found to be quite simple—a plain flat-top stool, with gratings round the sides, being provided in the centre of the heap for the distribution of the fumes. The system, it will be remembered, has been well spoken of by the Inspectors under the Alkali Acts; and Mr. Dunn also reports very favourably of it—no evil effects being traceable to it. From this point the visitors were taken to the workmen's recreation-rooms, where light refreshments were served. From here they went to the retort-house, and saw the discharging of the retorts by means of the "Jenkins De Brouwer" pusher, and the charging of them by the De Brouwer projector. In these machines and their effective operation, the visitors displayed much interest. The coke plant was greatly admired, especially that portion dealing with the distribution of coke in the yard and its loading for despatch. It is unnecessary to enter into a detailed description of the plant, as a full account of it has already been given in the "Journal." An inspection having been made of other sections of the works, the party was photographed. A little time remaining before the business meeting, a number of the members utilized it by looking at the carburetted water-gas plant.

The Business Meeting.

From the gas-works, the members proceeded to the Masonic Hall, where the business meeting was held. The President, who was heartily applauded on taking the chair, introduced to the company the Mayor of Stockton-on-Tees (Alderman F. Byers Watson).

Mayoral Welcome.

The Mayor said that, when Mr. Ford asked him to be present on this occasion in his capacity as Chief Magistrate, he replied that no duty he would have to perform during his year of office would give him greater pleasure. This was chiefly so because it was Mr. Ford's year of presidency of the Association. He had known Mr. Ford all his life, and could testify to the good work he had done in the town. They regarded him as a gas manager second to none in the kingdom. During the whole of the forty years he had been Manager, the gas-works had been remunerative. They had always been "pulled" at to help the rates, and they had invariably responded; and he showed they would continue to do so. He had, as Mayor, great pleasure in welcoming the members to the town, and trusted they would have a pleasant and profitable time, and that their deliberations would be conducive of good generally.

The President next introduced to those present Alderman Harrison, the esteemed Chairman of the Gas Committee.

Alderman Harrison said it gave him very great pleasure indeed to be present to welcome the members of the Association to the town. They felt proud, locally, to know that their good friend Mr. William Ford was so prominent a member of the Association, because they all held a very high opinion of him. He had been among them for many years, and they hoped to keep him for many more. He was certain of this—that they would keep him as long as he was able to employ his time in looking after the interests of the gas undertaking. They esteemed him, not only because he was Manager of their gas-works, but because of his kindly and generous disposition. He had proved an important asset to the town by making money for them; but they valued him even more because of his kindly nature, and the manner in which he showed it in all his dealings. He joined with the Mayor in welcoming the members to the town; and he trusted that their deliberations might be conducive, not only to their own interests, but the interests of Stockton-on-Tees.

The President said they would agree with him that they were very much indebted to the Mayor for his courtesy and kindness in coming to welcome them that morning, and also to the Chairman of the Gas Committee.

Apologies for Absence.

The Hon. Secretary (Mr. Herbert Lees, of Hexham) read a number of telegrams and letters he had received expressing regret at inability to be present; the apologists, including Sir Robert Ropner, Bart., M.P. for Stockton-on-Tees; Mr. Thomas Glover, President of the Institution of Gas Engineers; Mr. Edward Jones, of the Wales and Monmouthshire Association; Mr. Harold Copp, of the Midland Association; Mr. Joseph Davis, of the Eastern Counties Association; and Mr. John Booth, of Southport, one of the founders of the Association, and its first Auditor.

Sympathy with Sir George Livesey.

The President referred with regret to the absence, through illness, of Sir George Livesey, one of the veterans of the profession, and moved a vote of sympathy with him, which was carried.

New Members and Associates.

The following candidates for membership and associate membership had been approved by the Committee, and were unanimously admitted. Members: Mr. George Percy Lishman, Manager of the Lambton Coke-Works, Fencehouses; Mr. W. F. M'Skelly, Manager of the Tanfield Lea Gas-Works, Tanobie, Co. Durham; Mr. Charles Henry Tritton, Manager of the Pelton Fell Colliery Gas-Works; and Mr. F. D. Richmond, Engineer, Manager, and Secretary of the Heckmondwike Gas Company. Associates: Mr. Thomas Perrouet Barker, General Manager to Messrs. Ashmore, Benson, Pease, and Co., Limited, Parkfield Works, Stockton-on-Tees; Mr. Clarence Harold Mark Fligg, Assistant Manager and Secretary to the Redcar Gas Company; and Mr. William James Whyte, Assistant to his father at the Seaham Harbour Gas-Works.

The President's Address.

The President then delivered his address, which was followed with keen interest and appreciation, and punctuated by applause and other expressions of approval.

PRESIDENT'S ADDRESS.

Gentlemen,—My first words to you to-day are of regret that your Vice-President of last year was by the call of duty prevented from occupying the position you were good enough to invite me to take up. You will remember that at our last meeting, when you honoured me by again electing me to the presidential chair, after a lapse of 28 years, I accepted the responsibility with considerable hesitation, knowing the great abilities of the President-Elect; and, having accepted, I expressed the hope that, with the good offices of the Committee and the able assistance of our esteemed Secretary, I might not prove a disappointment, despite my advanced years. I feel highly honoured in occupying the chair to-day, and rejoice to think that I have retained the good opinion of my old friends, and am pleased to accept the good wishes of the younger members as friends, and would once again tender my thanks for the honour conferred upon me.

While giving some thought as to the nature of my remarks to-day, the suggestion in Mr. Thomas Hardie's admirable Presidential Address of 1906—that some Past-President might take up a more comprehensive review of the preliminary proceedings and formation of our present flourishing Association—commends itself to me. This course I venture to take up to the best of my memory, aided by the minutes recorded in the published "Transactions" of the Association—leaving to the younger members and the Technical Press for the time the introduction and discussion of the latest developments of gas manufacture, distribution, application and financial matters relating to the varied interests and positions of our great industry, which is antecedent to such national and extensive interests as (for example) steam navigation, railway systems, our sister illuminant, and many other present-day developments.

For some years before it was finally decided to form the present North of England Association, a few individuals used to meet in the Newcastle and Gateshead Gas Company's offices to have a chat with our late lamented friend Mr. William Hardie, not only on matters of deep interest to those in touch with the gas industry, but also to listen to, and enjoy, the versatility of his comprehensive knowledge of literary and commercial matters. Those who were permitted to enjoy the close association of private friendship with him can never forget that he was one of Scotland's genial sons who had crossed the Tweed to shine in one of the most favoured commercial centres of her sister England, to the great advantage of the Newcastle and Gateshead Gas Company, and also to his many friends.

The pleasures and benefits derived from those periodical interchanges of opinion, and Mr. Hardie's unbounded enthusiasm for the advancement of the gas industry, re-echoed by a few congenial spirits, resulted in the proposal to form the North of England Gas Managers' Association. On April 10, 1877, twenty-eight

gentlemen interested in the proposal met together in the Board-Room of the South Shields Gas Company. Of those present at that early meeting, many have, I regret to say, joined the majority. The late Mr. W. H. Atkinson, of the Tynemouth Gas Company, was elected to the chair. The promises of support received from those unable to attend the meeting were so encouraging that there was no doubt as to the general feeling regarding the formation of a District Association. The meeting straightway proceeded to draft the rules and regulations—the majority of which are so familiar to us to-day that they need no repetition by me. The late Mr. Warner was unanimously elected to the first Presidential Chair, and Mr. Hepworth (whom we are glad to have here to-day) was chosen Vice-President; while Messrs. J. H. Cox, C. Sellers, T. Trewhitt, and myself formed the first Committee.

At that early gathering, the question as to the number of meetings to be held in the year brought forth some little discussion, but finally it was decided that there should be half-yearly meetings in April and October—the first general meeting to be held in Newcastle. Arrangements having thus been completed for the launch of the new craft upon the waters of practical usefulness, the preliminary meeting terminated, with a vote of thanks to Mr. Atkinson for his conduct in the chair. The members then paid a visit to the gas exhibition, which was being held under the auspices of the South Shields Gas Company. It was, I believe, one of, if not the, first public exhibition of its kind, and doubtless gave a great stimulus to the vast development of cooking by gas now so prevalent throughout the country, and a boon of no mean kind to gas companies and corporations owning gas-works, as well as to the consumers. After that interesting visit, the members again met together to enjoy the hospitality of the South Shields Gas Company, under the chairmanship of Mr. Wallis; the usual votes of thanks being accorded to the Chairman and Directors.

As decided at South Shields, the first general meeting was held in Newcastle on Oct. 27, 1877, when, by the courtesy of the Newcastle and Gateshead Gas Company, the members and associates met in the Board-Room, which has been so intimately connected with the Association. Before introducing the day's business to the meeting, Mr. Warner in his address referred to some of the older Associations connected in some way with the industry. Among them he mentioned the Gas-Fitters' Mutual Association which was formed in London in 1850. The object of this early Association was, among other things, to quote from the rules: "To encourage the general adoption of gas for culinary and other purposes, or its extended use in processes of manufacture, and to acquire information on the simplest and most efficacious modes of ventilation in connection with that mode of lighting." My object in thus quoting from their rules is to direct your attention to the clause referring to ventilation; for surely this question has received scant attention in the past, but is, I think, worthy of consideration at the present time.

The Gas-Fitters' Association held monthly meetings, at which papers were read and excellent lectures delivered, some of which will be remembered by our oldest members as the ground-work of their student days. Mr. Lewis Thompson's prize essay on "Coal Gas" was delivered to the Association; and Mr. Wright's carbon-bisulphide apparatus was first publicly exhibited at one of their meetings. The life of this Society was apparently so particularly strenuous that they exhausted their energies at an early age, for there is no record of their doings after the exhibition of gas apparatus which they organized and held in the Polytechnic Institution in 1851.

It is remarkable that the advantages to gas managers of a similar Association were not appreciated for twelve years after. To the county of Fife belongs the honour of forming the first Association of Gas Managers; for in 1862 the North British Association came into being. The publication of their proceedings in the "Journal of Gas Lighting," and the knowledge of the good work done by the Gas-Fitters' Association, suggested to Mr. Warner the desirability of forming a British Association. His letter to the "Journal" on this subject resulted in the formation of the parental Association; the first meeting being held in Manchester under the presidency of the late Mr. Adamson. The need for District Associations also having been realized, active steps were taken in different parts of the country to further their formation. The Manchester Association was formed in 1869, the West of Scotland in 1872, the Southern District in 1875, and our own Association in 1877; and so the list went on increasing, until to-day there are thirteen Senior and six Junior Associations connected with our profession, represented by a total membership of many hundreds.

The formation of so many different Associations was viewed with considerable anxiety in the early days; for it was felt that their influence would not be beneficial to the British Association, but would tend to lower its tone, rather than elevate. This view was at one time firmly held by our first esteemed President; but in that first address he told us he had altered his opinion and that he felt, as I think we now all feel, that their influence is highly beneficial in many ways, both to the central body and to the profession generally. The President, after dwelling upon the importance of the newly-formed Association, brought his admirable discourse to a close by reading a letter of congratulation from the Secretary of the British Association. Having completed the business of the day, the members inspected the Redheugh Gas-Works, and were afterwards entertained at uncheon by the hospitable Company. Alderman Hedley, the Chairman of the Board, occupied the chair, and a very enjoyable time was spent.

Before leaving this, for us, historical year of 1877, it might perhaps be interesting to mention that my esteemed and worthy predecessor, Mr. Corbet Woodall, and other Metropolitan engineers made somewhat extended trials of an automatic lighter of the pressure type; but so far as I know, the system never came into general use.

In 1878, our autumn meeting was held in Carlisle, under the presidency of Mr. Hepworth. In his address, Mr. Hepworth referred to the rapid growth of membership—in one year there had been an increase from forty to a total of seventy. Many valuable suggestions were contained in the address; and I would like to draw your attention to some of them, in the light of present-day conditions. Among other things, Mr. Hepworth suggested the formation of an official centre where useful scientific research in matters relating to the gas industry could be carried on, under the guidance of our Association. As you are aware, the idea has never been carried out in all its details, yet the somewhat recently created Chair in the Leeds University is a step in this direction, which, under the fostering care of Professor Bone, will, I feel sure, yet fill an important position in our industrial pursuits. Our worthy President, recognizing that future development should not be left to the labours of a few, went on to remind us that individual progress was demanded of even the least of us. I will give you his words, for I think them worthy of repetition. He said: "I do think that companies and corporations owning moderate-sized works might follow the example of the Paris Gas Company, by devoting sums of money from their profits, annually, for purely experimental purposes, and that in larger works the whole time of at least one officer might be advantageously occupied in this way." This is truly a suggestion which in these days of keen competition should appeal to every thinking Board; for it would, if carried into actual practice, create many diverse channels of useful investigation, which, it must be admitted, are somewhat lacking to-day, in a scientific system, on the manufacturing side of the industry.

To achieve greater success in the future than even has been achieved in the past, every member of the profession must realize that with him rests a share of personal responsibility for the advancement of our great industry; for I fear that although great efforts are being made in the upward direction by our leading men, yet a large majority are inclined to readily adopt other people's ideas without due thought, which course does not always result advantageously. Having referred to the many wonderful things that had been prophesied of the recently introduced electric light, including among those not fulfilled the expected extermination of all gas-works, Mr. Hepworth brought his admirable address to a close.

After the usual business had been transacted, the question of entertaining the members of the British Association of Gas Managers during their intended visit to Newcastle in the following June was submitted to the meeting; and it was decided that the President, Vice-President, and Committee of our Association should make arrangements for entertaining the Parent Society. At the conclusion of the meeting, the members spent a very enjoyable time visiting the historic cathedral and castle, and were afterwards entertained at dinner by the Mayor of Carlisle.

In 1879, the April meeting was held in Newcastle—Mr. Hepworth occupying the chair. Owing to the vast amount of business before the meeting, the President limited his remarks to the general progress made in the manufacture, distribution, and the commercial side of the industry since our previous meeting. An interesting paper on the "Manufacture of Sulphate of Ammonia" was read by Mr. W. Hardie; and Cowan's automatic pressure changer was exhibited and explained to the meeting. The usual social function ended the day's proceedings.

Referring, again, to the visit of the British Association of Gas Managers to Newcastle, it is pleasing to remember that our Reception Committee, elected at the Carlisle meeting, after making appeals to those interested in the somewhat notable event, found themselves in the happy possession of a very substantial sum wherewith to show the high appreciation of the honour conferred upon our Association and our Past-President by the visit to Newcastle. The British Association met in Newcastle on Wednesday, June 11, 1879, to transact their usual business, under the Presidency of Mr. Warner; and after the formal meeting, the Annual Association Dinner was held in the Town Hall—Mr. Warner presiding. On the following day, at our invitation, they visited Alnwick Castle and surrounding district. Unfortunately, stormy weather, in a measure, prevented the natural beauties of the locality from showing to full advantage; but despite the adverse conditions, the excursion was thoroughly enjoyed. The ancient castle of the Duke of Northumberland and the exquisite gardens formed a great attraction, especially to our Southern colleagues and lady friends. The dinner in the Alnwick Corn Exchange, where, as your President, I had the honour of presiding, ended a very enjoyable and memorable day. On Friday, we had the pleasure of taking about 300 members and friends by steamer to visit Sir W. G. Armstrong and Co.'s Elswick Engine and Ordnance Works, also the hydraulic machinery of the Swing Bridge, and afterwards to inspect the Redheugh works of the Newcastle and Gateshead Gas Company, whence we proceeded to Tynemouth, where a really magnificent banquet was served in the Assembly Hall of the Aquarium. Alderman Hedley, the Chairman of the Newcastle Gas Company,

occupied the chair, and Messrs. Hepworth and Trewhitt the vice-chairs. A most enjoyable time was spent; and our friends' evident appreciation of the arrangements was very gratifying to our Association.

The fifth half-yearly meeting of our Association was held in Stockton on Oct. 4, 1879. After inspecting the gas-works and Messrs. Blair and Co.'s Marine Engine Works, the company adjourned to the Council Chamber, where they were officially welcomed by the Mayor—Alderman J. Richardson, J.P.—and other members of the Corporation. Following the usual preliminary business, several short papers on diverse matters were read, and a large collection of coal-tar dyes, belonging to Mr. S. A. Sadler, was exhibited. A lucid description of the more important products by Colonel (now Sir Samuel) Sadler, was highly appreciated by the members, and I believe led up to the excellent and memorable paper on "Coal Tar," delivered by Colonel Sadler at York in 1882.

After transacting the ordinary business, I had, on behalf of the Association, the pleasure of presenting a handsome timepiece to our first Honorary Auditor (Mr. J. Booth, of Middlesbrough), who was leaving the district to take up the management of the Southport Corporation gas undertaking. Mr. Booth, as many of you are doubtless aware, is now enjoying the fruits of his labours in leisurely retirement in the town of his adoption. At the close of the meeting, the members, at my invitation, assembled in the Masonic Hall for dinner, at which the borough Member of Parliament (the late Alderman Dodds), Alderman Knowles, and other members of the Corporation were present. The usual loyal toasts were honoured and responded to.

At the time of our Association's visit to Stockton in 1879, there was a serious depression in trade extending over the surrounding country. It is an unpleasant coincidence that this present visit should be similarly accompanied; but it is to be earnestly hoped that, with the settlement of the engineers' dispute, prosperity may return to the district and the country at large.

The April meeting of 1880 was held in Newcastle. After a short business meeting, the members journeyed by rail to Jarrow, to inspect Mr. Warner's patent stoking machine at the South Shields Gas Company's works. Mr. Warner's description and the actual working of the machine were greatly appreciated by the members; but, so far as I know, the system of mechanical charging was never adopted outside the Jarrow Gas-Works. Doubtless at some future time our esteemed Vice-President may be able to favour us with some information on Mr. Warner's laudable attempt in those early days to reduce carbonizing charges by the substitution of mechanical for manual labour.

Time will not permit me to recount the doings of the Association over a greater period. Suffice it to say that, under the able direction of such worthy Presidents as Mr. J. H. Cox, of Sunderland, Mr. T. Trewhitt, of West Hartlepool, Mr. Charles Sellers, of York, Mr. Wyatt, of London, Dr. Sadler, and many others of the younger school of eminent men, the Association has continued to thrive.

Before closing my remarks, I would like to submit a few particulars of the Stockton gas undertaking, with which I have been permitted to be associated for so many years. On May 15, 1821, the Royal Assent was given to a Bill for lighting the town and borough of Stockton with gas. On June 27, the laying of the mains was commenced; and the town was first lighted by gas on Nov. 14, 1822. In 1856, the Stockton New Gas Company and the Stockton Gas Consumers' Company, Limited, jointly promoted a Bill in Parliament for the amalgamation of the two concerns, and to authorize the united Company to sell their undertaking to the Mayor, aldermen, and burgesses of Stockton, and for other purposes—with a capital of £25,000, and borrowing powers. This Act received the Royal Assent on July 27, 1857. Thus the Corporation have been in possession of the gas-works for a period of over fifty years. When they took over the works, the annual make of gas was, I understand, only between 20 and 25 million cubic feet.

Under the new *régime*, considerable developments in gas consumption took place, until in 1869 the make rose to 54 millions. Entering upon the duties of my present position in the early part of 1869, it was very gratifying to find the consumption steadily increasing, as shown by the appended table, until in 1902 it had reached 385,145,000 cubic feet.

Table showing Capital Expenditure per Ton of Coal Carbonized.

Stockton-on-Tees Corporation Gas-Works.

Year.	Gas Made.	Total Capital Expended.	Capital Redeemed.	Capital Unredeemed.	Coal Carbonized.	Average per Ton Total Capital.	Average per Ton Unredeemed Capital.	Price of Gas.
	Cubic Feet.	£ s. d.	£ s. d.	£ s. d.	Tons.	£ s. d.	£ s. d.	
1869	54,155,700	—	—	—	—	—	—	—
1870	62,403,800	—	—	—	—	—	—	—
1872	79,342,000	32,132 5 3	5,775 2 10	26,357 2 5	8,704	3 14 0	3 0 0	3s. net
1873	88,762,000	31,715 10 5	6,647 3 11	25,066 6 6	9,973	3 4 0	2 19 0	—
1882	175,509,000	99,841 7 7	20,174 7 9	79,666 19 10	18,657	5 7 0	4 0 0	—
1892	304,612,000	137,806 0 0	51,448 0 0	86,358 0 0	33,178	4 2 0	2 13 0	2s. net
1902	385,145,000	191,935 2 4	88,073 15 7	103,861 6 9	38,000	5 1 0	2 14 7	2s. 5d. net

Table Showing Capital Expenditure per Million Cubic Feet of Gas Made.

Stockton-on-Tees Corporation Gas-Works.

Year.	Gas Made.	Total Capital Expended.	Capital Redeemed.	Capital Unredeemed.	Total Capital Average per Million.	Unredeemed Capital Average per Million.
	Cubic Feet.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1872	79,342,000	32,132 5 3	5,775 2 10	26,357 2 5	404 0 0	332 0 0
1873	88,762,000	31,715 10 5	6,647 3 11	25,066 6 6	357 0 0	282 0 0
1882	175,309,000	99,841 7 7	20,174 7 9	79,666 19 10	510 0 0	454 0 0
1892	304,612,000	137,806 0 0	51,448 0 0	86,358 0 0	419 0 0	284 0 0
1902	385,145,000	191,935 2 4	88,073 15 7	103,861 6 9	498 10 6	269 15 4

The demolition of certain large iron-works in the district of supply, consequent upon the more general introduction of steel for shipbuilding and general engineering purposes, and also the fact that the works remaining put down their own electrical installations for lighting and power purposes, coupled with the advent of the Corporation electrical undertaking and also the natural decrease due to the general introduction of incandescent mantles, all combined to retard for a time the further increase in consumption which had been anticipated, and previously prepared for, by the installation of a carburetted water-gas plant and extensions of the coal-gas plant—bringing the total producing capacity of the works up to 500 million cubic feet per annum. During the last few years, a steady increase has developed, and the serious breaks in the continued prosperity of the undertaking have practically been overcome, chiefly through increased day consumption due to the more extended use of cookers and slot installations; so that a new era of prosperity appears to have been entered upon.

A few remarks upon the impending changes in the carbonizing department, without going into the statistical and scientific details which have been laid before the Institution of Gas Engineers at this year's London meeting (which was so ably presided over by our esteemed friend Mr. Doig Gibb, Chief Engineer of the Newcastle Gas Company), and the results which have since appeared in the Technical Press. Looking back over the many proposals which have at various times been put forward to bring about continuous carbonization, it is interesting to note that the system adopted by Mr. Scott, of Musselburgh, as described to the West of Scotland Association in 1874, although differing in many details, approached very nearly to some of the systems now before us in a more scientific and mechanical form. Another serious attempt to solve the question, which, however, did not meet with any marked success, was the Yeadon rotary retort, which was experimented with in Leeds, and described to our Association by our friend Mr. Terrace, at the April meeting of 1893.

It is pleasing to note that the North is again leading the van in our own industrial pursuits, as it has before, by the installation of the Woodall-Duckham vertical retort at the Linacre Gas-Works, Liverpool; and the decision of the Sunderland Gas Company, upon the recommendation of their worthy Engineer, Mr. C. Dru Drury, to erect an installation of the Dessau verticals, which I sincerely trust will prove satisfactory, and act as a stimulus to other companies and corporations to move in this direction. My personal feelings with regard to the various methods of carbonization now before us is that in the Woodall-Duckham vertical retort will be found, ere long, the beau-ideal of continuous carbonization; and I am sure that we all have great expectations of still more efficient results from the new installation of the system now being completed at the Gaslight and Coke Company's works. I had hoped to be able to lay before you some of the results there obtained; but, unfortunately, it is not expected that the plant will be at work for at least another week. I understand that the settings at Poole continue to give about the same results as those contained in Mr. H. W. Woodall's paper to the Institution in June. Whether these new systems will entirely supersede the present

economical arrangements of horizontals with the most recent charging and discharging machines, or the inclined system, time and experience alone can demonstrate.

I fear I have already occupied your time too long. In conclusion, I would again tender to you my thanks for the honour you have conferred upon me and this ancient town of Stockton by your second visit; for, with the exception of Newcastle and South Shields, it is one of the very few towns upon which this distinction has been conferred. One of such places that comes to my memory is that of the neighbouring town of West Hartlepool, where we met for the second time under the presidency of our respected friend Mr. Bower.

Although in passing through the streets of this town you may not notice during your limited visit anything of special interest, I would remind you that Stockton can trace its Mayors back in a direct line to 1495, and that in Bridge Road the first rail of the first public railway in the world was laid down in May, 1822. It was also responsible for the construction of one of the very first steel ocean crafts. The lucifer match was invented by a Stockton chemist in 1827. The first rails ever laid down in China were rolled in Stockton at the Moor Works; and the first Big Ben for Westminster Clock Tower was cast here. More recently many gigantic bridges have been formed in the local bridge yards and erected in nearly all parts of the world; and, of course, there is an engineering works here more intimately connected with our own industry.

My last words are again a reminder to the younger members of the profession that with them rests a great responsibility for the advancement of the industry we have at heart; and I am sure that from all the signs of progressive enterprise showing to-day the advance will be a triumphant march. I thank you for your kind attention, and trust that your memories of this meeting may be pleasant ones.

Copy of a Circular issued by the Stockton Gaslight and Coke Company to their Consumers in 1828.

STOCKTON GASLIGHT AND COKE COMPANY.

Unquestionable evidence having been obtained that many of the consumers of gas have, to the great injury of the Company, for a considerable length of time, been in the practice of allowing the flame of their burners to exceed greatly the height prescribed, also of using argand burners without glasses, and of having burners both in respect of size and construction different from those required, and likewise not only of continuing their lights beyond the hour limited, but also of frequently availing themselves of them in a morning, the Company deem it expedient to remind the parties complained of that, by the agreement they have entered into, they have engaged "that the flame of the argand and jet burners be regulated by the stop-cock so as not to exceed the height of 3 inches, that the argand burners must not be used without glasses, and that the lights be extinguished and the main cock turned off within a quarter-of-an-hour from the time agreed upon, except on Sunday evenings, when the Company will allow them to burn until midnight if required. Also that the burners to be used are to be of the description specified in the scale of prices published by the Company, and that gas is only to be used during a stated period of each night in the week, except Saturdays, and not in any morning."

While the Company, in justice to themselves, take this method of notifying the detection of the abuses alluded to, in the hope of inducing a strict and general compliance with the terms of the contracts in future, they feel it incumbent upon them to acknowledge that the majority of the consumers have faithfully attended to the regulations stipulated to be observed.

It is the anxious wish of the Company to afford a regular and efficient supply of gas upon as low a scale of prices as possible; but it must be obvious it will not be practicable to accomplish their object if the violations of the contracts which have hitherto prevailed be persevered in. They therefore trust they will be deemed excusable in giving notice that in the event of their occurring in future the most effectual measures will be adopted to obtain redress.

By Order of the Committee, T. RANDYLL, Secretary.

Stockton, Sept. 25, 1828.

LEEDS UNIVERSITY FUEL DEPARTMENT.

Professor BONE, D.Sc., F.R.S., of the new Department of Fuels and Gases at Leeds University, delivered an address; his remarks having special reference to the concluding paragraph in the Presidential Address, as to the responsibility which rests upon the younger members of the Association for the advancement of the gas industry. A movement had been inaugurated at Leeds University in order to enable them to discharge this responsibility as faithfully and with as much distinction as it had been discharged by their predecessors, and by the older members of the profession still in harness. It was a matter of very great satisfaction to him personally that, at the time of the inception of this movement, which he hoped and believed would be successfully developed as time went on, he was privileged to be asked to connect himself with it. His scientific work, up to the time when he removed to Leeds, had been almost entirely connected with the chemistry of gases; and he regarded it as a very fortunate coincidence that this department at Leeds was established for the prosecution of investigations and the dissemination of knowledge upon the chemistry of gases, just when, so to speak, he was looking for something to settle down to. This department was established primarily as the result of the foresight and interest shown in the industry by his friend Professor Smithells, who was encouraged to take it up by Sir George Livesey. He at once adopted the idea with his usual enthusiasm for what he considered to be a good and right thing; and he promised that, if the movement was inaugurated, he would use his best endeavours to secure for the University of Leeds sufficient financial support to carry out the work. He (Professor Bone) need not, therefore, speak of any financial aspect of the movement. What he wished to bring before them was the fact that the laboratories had been completed and equipped; and that they were now ready and waiting for the reception of students. He felt he was speaking to gentlemen who were fully acquainted with the needs and possibilities of the future of the industry, and who realized the necessity now-a-days of the gas managers of the future receiving a scientific training in the fundamental subjects which lie at the base of every-day practice. At Leeds, at all events, they were fully alive to this need, which was proved by the fact that they were the first great Technical University to inaugurate a Department of Fuel, and one which had special reference to the industry of those he was addressing. What they most wanted at present was students; and they appealed to gas managers who had sons who were destined for this great industry to help the movement in the best way they possibly could—that was to say, by sending their sons to them for their courses. They had, no doubt, read the very extensive and exhaustive description of their laboratories which appeared in the "JOURNAL OF GAS LIGHTING" last December; and he need only add that, should any of them be in Leeds, he would have great pleasure in personally showing them what their equipment was which was depicted in the article. The new session commenced on Monday, Oct. 5; and they hoped then to receive the entry of a good number of students. It would be necessary in the course of the next year or two to complete certain arrangements which were in contemplation for specialized courses to be given by gentlemen who were connected in some advisory character with the industry. They wished to have the courses given by men who could speak from first-hand knowledge of the process of carbonization and distribution of coal gas. They would like, therefore, to know, if possible during the ensuing few weeks, of any students who might be likely to come to them within the next two or three years. They did not ask for guarantees; but the members of the Association could help them very much in formulating the courses by letting them know of students likely to come to them, because the suggested arrangements could be made the more adequate the more they felt that the response was likely to be adequate.

VOTES OF THANKS.

Mr. H. WILKINSON (Harrogate), in proposing a vote of thanks to the Stockton Corporation Gas Committee for their permission to inspect the works, said the conclusion they all came to was that the undertaking was thoroughly up-to-date. They had been very much interested in what they had seen; and he had no doubt that it would prove instructive also. The development of the gas undertaking at Stockton seemed to have been of a marvellous character, seeing that, whereas in 1857 there was only a consumption of 25 million cubic feet, their friend Mr. Dunn informed them that it now approached 500 millions. The works were such as the Corporation might well be proud to possess; and they formed a valuable asset to the town.

Mr. WILLIAM THOMPSON, Chairman of the Blyth and Cowpen Gas Company, seconded; remarking that it had given them all very great pleasure to inspect the works.

Alderman HARRISON, responding, observed that during the forty years Mr. Ford had been Manager, they had been able to pay off over £100,000 of capital, besides devoting large sums to the relief of the rates; and the position in which the concern stood in their books that day was most satisfactory. They were all naturally proud of their works and of the Manager.

Mr. THOMAS HARDIE (Gateshead) moved a vote of thanks to the President for presiding, and for his able address. They had, he said, for the first time a President who had previously occupied the position; and his review of the history of the Association was of interest and value, especially to the younger members.

The motion was seconded by Mr. J. H. PENNEY (South Shields), who remarked, amid laughter, that they found everything at the works so spick and span that they could only conclude that they were dressed in their Sunday clothes.

The PRESIDENT said he should carry the memory of this occasion to his grave. As to the condition in which they found the works, he took no credit for this, but gave it all to his Assistant, Mr. Matt. Dunn. To him was to be attributed the whole of the credit for the cleanliness and appropriateness of the works.

Complimentary Dinner to the President.

Subsequently at the Queen Hotel, the members of the Association entertained the President to a complimentary dinner. The chair was occupied by Sir SAMUEL SADLER, of Middlesbrough, who was supported at the top table by the guest of the afternoon, the Mayor of Stockton, Alderman J. Samuel, Alderman R. Hind, J.P., Professor Bone, F.R.S., Mr. Joseph Hepworth (Edinburgh), Mr. W. Doig Gibb (Past-President of the Institution of Gas Engineers), Mr. H. Wilkinson, of Harrogate (Past-President of the Association), and Mr. Thos. Bower, of West Hartlepool, an old friend of the President. The company numbered nearly 150.

The CHAIRMAN, in proposing the toast of "The King," remarked that he was only a lay member of the Association, but he had been a member ever since its existence. He recalled with pleasure the many convivial meetings they had had in the old

days. Although he was not a manufacturer of gas in the strict sense of the word, all his friends accused him of being a very large manufacturer of it in an oratorical way. (Laughter.) Some went so far as to describe him as a purveyor of "gas" of low illuminating power; and others referred to it as sulphurous, and as burning quite blue on occasions. (Laughter.) These, they would all agree, were wicked criticisms. In regard to Mr. Ford, he was sure they could not do too much in letting him see how greatly he was respected, admired, and beloved by them all. Sir Samuel then submitted the loyal toast.

"His Majesty's Imperial Forces" was proposed by Mr. W. DOIG GIBB, and responded to by the MAYOR, who was for several years a colonel of Volunteers.

PROGRESS IN GAS SCIENCE.

The important toast of "Our Guest" had been entrusted to the able hands of Mr. J. HEPWORTH. He felt, he said, some diffidence in performing the task, because he thought it should have been entrusted to one who was in charge of a gas undertaking. However, he loved his friend Mr. Ford, whom he had had the pleasure of knowing for a great number of years. He recalled that, some thirty years ago, two or three men in Cumberland initiated a correspondence with a view to the establishment of a Gas Managers' Association. The correspondence extended to Newcastle and to the Teesside district; and the five or six men who made the present Association possible were referred to in the address delivered by the President that morning. He need hardly tell them that Mr. Ford was one of them. But for the action of these men, the Association would never have been formed. When he was journeying to the meeting, his thoughts inevitably turned back to the early days of the Association; and he would like to refer to some problems which then engaged their minds. It was about the time of the electric light scare; and shareholders and others connected with gas undertakings were becoming seriously alarmed as to the prospects of the gas industry. He did not think that this alarm entered largely into the minds of engineers and managers of gas undertakings at the time; but the fact of the scare did emphasize very deeply the necessity for such Associations as this, where they could come together periodically to read and discuss scientific and technical papers, to know each other better, and to confer together on the thousand-and-one subjects that were of interest to them in their profession. Now, he thought the problem uppermost in the minds of the men to whom he referred—the engineers and the gas managers of that time—was this: What could be done to reduce the cost of gas? Well, they had been thinking of this problem for the past quarter-of-a-century; and he hoped, and had no doubt, that it would occupy their minds for many more years to come, for there was always room to improve. Let him recall some of the questions that arose out of this. They were then beginning to discuss the subject of regenerative furnaces. Sir William Siemens invented the furnace at least 25 years before the period referred to; but though the invention had been in existence all that time, it was not then known, or scarcely known, in this country. It had, however, been adopted about two years before at one of the Paris Gas-Works. They all knew how much they owed to the regenerative furnace in the way of the reduction of the cost of gas. He recently visited two works in the south of England. In one the manager told him that he was selling 4 cwt. or so of coke to the ton of coal; while in the other they were selling 11 cwt. They would see what difference this (about) 6 cwt. made in the cost of gas per 1000 cubic feet—it was at least 3d. or 4d. Again, they had not yet got out of the area of discussion on stoking machinery. It was just beginning to be discussed when the Association was formed; but to-day the machinery was being used, and the results in the cheapening of gas were well known. Before the Association was formed, the make of gas per ton was anything they liked, except that it never exceeded 10,000 cubic feet; and a man thought he was doing well if he made something over 9000 feet. But, thanks to the higher temperatures now possible through regenerative plant, and a better knowledge of the conditions existing in the retort-house, the make had been increased by a great deal more than 10 per cent.; and he supposed this meant a further decrease in the cost of gas of at least 3d. or 4d. per 1000 cubic feet. Then, again, unaccounted-for gas had been considerably reduced during the past thirty years, largely as the result of such Associations as theirs. He remembered that at one of the first meetings of the Association a friend boasted that he had made 10,000 cubic feet of gas per ton of coal, and that his leakage never exceeded 10 per cent. He (Mr. Hepworth) ventured to reply that he thought even a 10 per cent. leakage might be improved upon; and his friend replied: "When you are able to do it, you had better tell us how." Well, he had seen it at less than 5 per cent. in a great many works; and he thought it had been down to this at his own works. They all knew how this had reduced the cost of gas. Then there was the other question which had arisen of late years, as to the development of the use of gas for heating and power, as well as for lighting. This had, he thought he might say, been both the cause and the effect of reducing the cost of gas; and they need only compare the day-load of 1908 with the day-load of 1878—about the time the North of England Association was formed—to be reminded of the enormous progress that had been made during the past twenty-five or thirty years. There was one other matter to which he would like to refer, and that was the enormous increase which had been effected in the volume of light obtained from a cubic foot of gas during recent years. The introduction of incandescent mantles and the high-pressure system had positively revolutionized their ideas as to the capabilities of gas for effective illumination at a minimum cost. These were a few of the problems which had engaged the minds of the members of the Association during the interval between Mr. Ford's first and second presidency. It could not be pretended that the Association had done great things; but it had at least taken its share in the discussion of the problems to which he had referred, and it also claimed its share in bringing about the great results which had sprung from these discussions. The Association had been a source of strength and of benefit to every gas undertaking in the district; and to every member it had probably given new ideas, new courage to face the difficulties before him, and new friends to increase the pleasures of life. Whatever might be their estimate of the advantages that had accrued from the Association, they would all agree that their guest and President, Mr. Ford, had ever been one who had sought to secure these advantages; and they were delighted to have him as President for a second time. He remembered how difficult it was to persuade him to take the chair 28 years ago; and he suspected that a similar trouble was experienced on this occasion. But, after all, there lay one of Mr. Ford's many virtues. If there was one man who was devoid of self-seeking and vulgar self-advertisement, it was Mr. Ford. It would have been a pleasure and an advantage to them all if he had taken a still larger share in the proceedings of the Association; but for what he had done for Stockton, as testified to by the Mayor and the Chairman of the Gas Committee, for what he had done for the district, so far as they, outsiders, had been privileged to witness his work, for the men he had helped, and the influence he had exerted, and for the example he had set them all, they were deeply grateful.

Mr. Matt. Dunn here sang, in first-rate style, an appropriate song entitled "Make New Friends, But Keep the Old," the sentiment of which strongly appealed to all present.

Mr. FORD, responding to the toast, which was drunk with musical honours, said that he felt utterly unable to adequately express his thanks for the most kind things that had been said of him, and the sympathetic reception accorded them by the company. He related some experiences of his early days to emphasize the value of bearing an honoured name, and urged the younger members to lead true and honest lives, and not to be discouraged by seemingly insurmountable difficulties. With regard to the Association, he felt proud to have taken a part, though a humble one, in establishing it. He wished specially to acknowledge the able assistance he had received during the first half of his year of office from Mr. Lees, the Secretary, and in conclusion again thanked the members for their kind reception of Mr. Hepworth's eulogistic remarks.

OTHER TOASTS.

In the absence through indisposition of Alderman Harrison, the toast of "The North of England Gas Managers' Association" was proposed by Alderman R. HIND, J.P., of Stockton, and was responded to by the VICE-PRESIDENT (Mr. T. H. Duxbury, of South Shields), who alluded to the brotherly feeling existing among the members of the Association. The progress of gas was, he thought, one of the chief features of the present day; and this progress emanated largely from such Associations as theirs.

Mr. H. TOBEY (Malton) proposed "Kindred Associations;" and Mr. TIM DUXBURY, the President of the Manchester Institution, made suitable response.

Mr. THOMAS BOWER (West Hartlepool) called for a pledge to the Chairman, who, he said, was a man of many parts and many aims and pursuits. He remembered first of all calling him "Dr." Sadler; then it was "Colonel," from his association with the Volunteers; now it was "Sir Samuel;" and he hoped it would next be "My Lord of Egglescliffe." Sir Samuel, when President of the Association, gave them one of the best papers they had ever listened to. He had been of great service to the gas world by reason of the study he had devoted to chemical research. He was one of the captains of industry on Teesside, and had his finger in almost every enterprise. He was a member of the Tees Valley Water Board, and Chairman of the Tees Port Sanitary Authority, and Alderman of the Middlesbrough Town Council.

Sir SAMUEL SADLER made a racy speech in reply to the toast, and urged the younger members of the Association not to imagine that the field of gas science was pretty well explored, and that there was nothing else to discover. He assured them that there was no finality in the gas industry, in chemistry, or in science.

In view of the interest that has been taken in an advertisement which recently appeared in the "JOURNAL" for a manager for a gas-works making 70 million cubic feet per annum, it may be well to state that until the middle of next month the vacancy will not be definitely filled. In the meantime, one of the men employed on the works has been put in charge; and should his services prove satisfactory, it is very likely his appointment may be made permanent.

We learn that Mr. C. E. Rosevear, of the Gaslight and Coke Company, and a member of the London and Southern District Junior Gas Association, who recently gained a first-class certificate in "Gas Engineering" at the City and Guilds of London Examinations, has also obtained from the London County Council an evening exhibition, tenable for two to three years, of the annual value of £5. "Gas Engineering" was one of the subjects he took in the latter course.

WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.

General Meeting at Llanelly.

Amid such weather as one is more accustomed to associate with the beginning of August than with the end of September, the members of the Wales and Monmouthshire Institution last Wednesday visited Llanelly, whose gas-works are managed by their new President, Mr. Thomas Acland. That their welcome was a cordial one on the part of Mr. Acland, goes without saying. In addition to this, however, the Urban District Council (Llanelly is, it may be remarked, a borough by prescription, but has not yet sought incorporation) co-operated with him in his endeavour to make the meeting as great a success as possible by placing their handsome Council Chamber at the disposal of the Institution; Mr. H. W. Spowart, the genial Town Clerk (who was present throughout the proceedings), by sending to the members copies of a local guide; and the proprietors of steel and tinplate works in the town, by showing the members the processes carried on there. Under such auspices, it is not to be wondered at that a thoroughly pleasant day was spent in "Tinopolis," as the town is familiarly termed.

In these times, when the cry of unemployment is loud in the land, it is particularly pleasant to make acquaintance with a town like Llanelly, where employment with good wages is plentiful, and industrial development is rapidly going on. In addition to its being the chief centre of the tinplate trade of the whole world, Llanelly possesses three steel works, timber yards, iron foundries, collieries, and other industries, as well as three docks, one of which belongs to the town. There are all these things to be seen—but no empty houses. On the contrary, building is going on in all parts of the district. In 1901, the population of Llanelly was given as 25,617; whereas there are now in the borough about 6500 houses, which, multiplied by five, gives a population of 32,500. These circumstances give plenty of scope for development of the business of the Gas Company; and Mr. Acland is taking advantage of them. During the six years he has been at Llanelly, the total number of meters in use has been more than doubled; the figures at the end of September being: Ordinary meters, 1405; slot-meters and installations combined, 960; automatic meters with consumers' fittings, 683; public lamp meters, 89. For slot-meters and installations an additional charge of 10d. per 1000 cubic feet is made; but with automatic meters where consumers provide their own fittings, the extra price is 6d. per 1000 feet. The rate of increase in consumption is now about 10 million cubic feet per annum; and by going on with the slot installations, Mr. Acland is hopeful of maintaining an increase of from 8 to 10 million cubic feet a year. The consumption at the present time is about 80 millions a year, and the price of gas ranges from 3s. 7d. per 1000 cubic feet for public lighting to 4s. 1d. for general lighting with ordinary meters. There are now about 60 gas-engines fixed; and the charge for supplying these is 3s. 9d. per 1000 cubic feet. This, of course, is still a high figure to charge for power purposes; but, at the same time, as an earnest of better things to come, it may be pointed out that Mr. Acland has already made three reductions in the price of gas. The Company's area of supply is a very large one—about 50 square miles; and at present they have only about 30 miles of mains. The Company was formed in 1835; and it will be remembered that their Act of 1874 has been supplemented by a further one this year. The original capital was £3000; and in 1874 this was increased to £50,000, with £12,500 borrowing powers. The new Act enables them to increase their capital by £66,166. Of the works themselves (which were last Wednesday open for inspection by members wishing to visit them), it need only be said that they await modernization when the time is ripe for carrying it out. Mr. Acland is a great believer in the utility of a show-room in the centre of the town as an aid to the business of a gas company; and such a depôt has been in existence at Llanelly for the past two years. In addition to there being an excellent assortment of fires, cookers, burners, and fittings, the show-room is made an office for the payment of gas accounts and the receipt of orders for coke, &c.—in fact, it is a town gas office. This, of course, brings the consumers into closer touch with the Company than would otherwise be possible. Mr. Acland's connection with Wales has been a somewhat long one; for he has occupied the position of Manager and Secretary to three Companies in the Principality—the Rhymney and Aber Valleys Gas and Water Company, the Brynmawr and Blaina Gas Company, and now the Llanelly Gas Company. His earlier appointments were at Cardiff, Dowlais, and the Swan Village and Saltley works of the Birmingham Corporation. He can thus fairly claim to have a close association with the Welsh Institution, the members of which were last week his guests.

The Half-Yearly Meeting of the Institution was held last Wednesday at Llanelly, the home of the incoming President, Mr. Thomas Acland; there being a very good attendance. The members on arriving at Llanelly assembled at the Stepney Arms Hotel, where light refreshments were provided by the President. After this they proceeded to the Town Hall, where the business meeting took place.

Mr. Thomas Canning (Newport), who occupied the chair at the commencement of the proceedings, said he regretted to have to inform the meeting that their good friend, and President to that day, Mr. Edward Jones, of Burslem, was prevented from being present. As a matter of form, therefore, he (Mr. Canning) had taken the chair; but he would not occupy it long. He was very pleased indeed—and he was sure he was only expressing the views of the gentleman whose place he had the honour to fill *pro tem.*, that was Mr. Jones—to welcome the members most heartily to the meeting; and he was glad, and their new President, Mr. Acland, would be gratified, to see in Llanelly such a large number of fellow gas managers. They were assembled in the Town Hall; and perhaps he (Mr. Canning) might, as a stranger to the town, more fittingly say than one actually living in it, how extremely kind and hospitable it was on the part of the Urban District Council to place at the disposal of the Institution such admirable accommodation. The members felt honoured by such action, and grateful to them as well.

Minutes of the Last Meeting.

The Hon. Secretary (Mr. Octavius Thomas, of Pentre) then read the minutes of the meeting which was held last May at Cardiff; and they were confirmed.

New Member.

Mr. Evan Rees, the Manager of the Brynmawr and Blaina Gas-Works, was elected a member of the Institution.

Introduction of the New President.

Mr. Canning remarked that his next duty was a most pleasant one. In fact, it was a duty which scarcely needed to be performed at all—namely, to introduce to them the new President, Mr. Thomas Acland. He was perfectly certain he would receive a cordial welcome, and that he would fulfil the duties of the honourable chair which he was now about to occupy in a manner worthy of the excellent reputation which he bore.

Mr. Acland, who on taking the chair was received with loud applause, then proceeded to deliver the following

INAUGURAL ADDRESS.

Gentlemen,—My first duty is to thank you all, and to express my sincere appreciation for the great honour you have conferred upon me by electing me President for the ensuing year of the Wales and Monmouthshire District Institution of Gas Engineers and Managers. The task before me of addressing you in a manner worthy of the honourable position you have given to me; worthy of the distinguished gentlemen who have occupied this chair before me, and acquitted themselves with such credit to themselves and such honour to our Institution; and not unworthy, I trust, of the future of the Institution and of those who will come after me and speak to you from this chair—the task is not a light one. For though we are as yet a very young body, we can, I venture to think, say with perfect truth that, as our inauguration was a robust and healthy one, so our rapid growth since has been as promising as the most sanguine among us could reasonably desire or expect.

I trust that my year of office will be a useful one—useful to the Institution in particular, as well as to the gas world in general, and to all who are in any way connected with its development and progress. To attain this end, I promise you that nothing shall be wanting on my part; and I am confident that you will all give me the same loyal and ungrudging devotion and help that you gave to my predecessors. For you all know that, by helping me during the ensuing year, you will be strengthening and promoting the best interests of the Institution.

As time proceeds, it brings to light many inventions and improvements in connection with the manufacture and distribution and economy in gas consumption, all of which have the tendency of pushing us many steps further forward in the march of progress, and in the eyes of the public, than our great competitor—the electric light. I shall not be accused of exaggeration or conceit when I say that we, as gas makers and distributors, have maintained, and are still well maintaining, our lead over electricity; and without being unduly optimistic, we can look forward to keeping this lead for many years to come. I do not propose to make a survey of these improvements, as carried out in the most modern and up-to-date gas-works. Our works at Llanelly may be said to belong to the older order of things, and are now awaiting modernization and improvement, when the proper time comes for doing the necessary work.

CARBONIZATION QUESTIONS.

I would like, in the first place, to make a few remarks upon a subject much before gas engineers at the present time—that is, vertical retorts for the carbonization of coal. The practical use of vertical retorts is of quite recent origin. Newbigging, in the seventh edition of his "Handbook," published in 1904, makes no mention of them. They were, however, tried experimentally, both in England and on the Continent, some time previous to that date; and it is recorded that Murdoch used them in his experiments in 1804. Their re-introduction in recent years appears to have been with the view of continuous working; but apparently

this has nowhere yet met with success, and the installations now in use are intermittent in their working, as in the case of horizontals and inclines. Successful experiments are now being carried on with inclined retorts set steeper than the angle of repose, so that they are full of coal; and as in this system the charge lies more open than in those set vertically, giving greater freedom for the expansion of the coal and for the gases to escape, it appears to be an advantage. It also allows of a greater length of retort, and the heat can be applied more regularly. Neither verticals nor steep inclines have been worked in sufficient numbers, or long enough, to afford accurate statistics of the cost of carbonizing and maintenance; but they undoubtedly require higher temperatures to burn off the charges in a reasonable time, and therefore one would suppose the life of the settings would not be as long as that of horizontals.

COKE-OVEN GAS.

Experiments are also being carried out with a view of adapting some of the systems in use in bye-product recovery coke-ovens for the production of illuminating and power gas. As in the case of verticals and steep inclines, it is quite certain that considerable modifications and improvements must be made before they are suited to the ordinary demands of a gas-works. The experiments to this end are best left to large producers, where the margin of make is considerable; and even if any of these systems eventually become reliable and economical in their working, it is a question if the initial outlay, the cost of maintenance, and the difficulty of regulating the output will make them suitable and convenient for other than sections of very large works.

THE LEWIS GAS-ENGINE.

Another matter I may be permitted to mention here as being new, to me at any rate, is an improved gas-engine. It is the Lewis gas-engine. The first has been erected and worked by the inventors and patentees, Messrs. Lewis and Briggs, of Llanelly. The feature of, and special merits claimed for, this engine are that it is reversible and capable of running at any varying speeds, and applicable, therefore, for marine propulsion as well as for stationary work and factory purposes. It is constructed and built on the vertical type; and it occupies small floor space. The engine runs beautifully, and answers perfectly to its reversing, slowing, and stopping gear—all actuated by one lever.

VALUE OF FREE SLOT INSTALLATIONS.

The next matter to which I wish to draw your attention is that of management. So far as my experience enables me to speak, and with your permission, I will relate to you a little of that experience during the time that I have been in the neighbourhood. This will lead up to the point of management generally which I wish to place before you. When I joined the Company, I found that gas, owing to its high price, was very unpopular; and other means of illumination and power were beginning to gain favourable hearing and consideration. One of the largest consumers had already given notice of his intention to discontinue; and his electrical plant and installation were nearing completion. This, of course, was a very serious loss to be faced. But we succeeded in overcoming it by promptly organizing a series of exhibitions and cookery lectures, which resulted in the purchase and hiring by consumers of a considerable number of cookers, and a consequent increase in the consumption of gas. A little later the local authorities replaced a number of gas-lamps with Kitson lights, which further reduced the public lighting consumption; and when almost about the same time they substituted smaller burners in the existing lamps, and left the town unlit during a number of nights when the moon was full, and because of other circumstances over which the Company had no control, a large decrease in the consumption of gas followed.

We did our best to make gas more popular, by reducing the price and proclaiming the economy of the incandescent mantle and improved burners. But there was every prospect of coal rising to an alarming figure. We redoubled our efforts with cookers, and succeeded in making matters go a little further forward; but we could plainly see that there must be a limit to this source of extension in the near future. It was at this point that I induced my Board to try free installations as an experiment. Each installation consisted of an automatic meter, one pendant, two side brackets, one cooker, as well as the necessary quantity of compo. pipe and sundries, all of which were fixed in the house at the entire expense of the Gas Company—neither tenant nor owner contributing one penny to its cost. The results were so encouraging that we decided to extend the principle; and I will now give particulars of the working of the scheme over a period of twelve months, in order that you may judge its value for yourselves. There are nearly 1000 free installations laid on; and I consider this scheme capable of being further extended in the district for at least ten years to come.

The district, I may say, is distinctly an industrial one, and may be taken to fairly represent the other South Wales towns. The Company's prescribed area for gas supply is about 50 square miles, with only about 30 miles of mains laid at present. The number of houses in the town of Llanelly is 6500, about 4800 of which are artizan dwellings, representing 73·8 per cent. In the immediate outer districts of the town there are about 4500 houses, of which some 85 per cent. are artizan dwellings. The number of houses is rapidly increasing. This gives 11,000 houses, of which number only 3030 are at present supplied with gas; leaving 7970 unsupplied. We can, I think, with confidence, count upon three-fourths of this number taking a free gas installation—say, 5977; and allowing for fifty installations per month, which will work out at 600 installations a year over ten years, this will, upon the present average of 10,000 cubic feet per house per annum, give 60 million cubic feet increase over that period. The capital expenditure would be, exclusive of service-pipes, £24,500; and 10d. per 1000 feet extra charge in excess of the charge to ordinary consumers for lighting purposes, on an average sale of 10,000 cubic feet per house, works out at £2500, or a profit of slightly over 10 per cent. per annum on the capital outlay. In arriving at these figures I have not added anything for loss of consumption through vacancies and change of tenancy, so that here you have a net result. It is quite possible that some of you in your own particular districts may be able to get a still larger average consumption, and a consequent greater percentage on your outlay. This shows that free slot-meter installations of gas supply are worthy of our careful attention and consideration.

In order to ascertain the value of this class of consumer to gas companies, as compared with others, I have made an analysis which shows the difference in percentage of gas consumed between the six summer months and the six winter months, calculating the summer to be from March 31 to Sept. 30, and winter from Oct. 1 to March 31, with this result:—

	Difference Per Cent.
1. Shops and business premises	39·63
2. Workshops	26·24
3. Ordinary dwelling-houses	33·01
4. Ordinary prepayment consumers	19·71
5. Free installation consumers	6·52
6. Public halls and buildings, including markets	31·67
7. Churches, chapels, and other places of worship	54·89
8. Gas-engines	4·21
9. Schools	67·98
10. Public lamps	47·64

These figures show that, with the exception of gas-engines, which give only 4·21 per cent. difference, the free installations are our best and most uniform customers.

What are the deductions to be drawn from these figures? That the free installation consumers are the best, and should be encouraged, because if you can increase your summer output and day load to make it more nearly approximate to the winter output, the better can your gas-works be carried on for the common weal: (1) It will enable you to reduce the capital expenditure per million cubic feet of gas sold, which is a very desirable thing. (2) It will reduce the unemployed carbonizing plant during the summer months (which, as you know, is a standing charge) and bring all the other apparatus more into action, which is also a standing dead charge while idle, or partially so. (3) By more uniform working, it will enable you to reduce the price of gas to the consumer. (4) It will increase the stability, importance, and usefulness of any company who can claim to have three-fourths of the artizan class on their books and supplying the every-man's or poor man's light, so to speak; and your position becomes far stronger against attacks of both competitors and opponents, especially the electricians, who not only have their eyes open, but are very wide awake indeed, and alive to even the slightest opportunity for pushing ahead. And unless we are fully alive to our own opportunities, we may one day see their representatives traversing our respective districts, and offering free installations.

There has been a lot said and written about free wiring of late. I will give you a case, which is certainly an unusual one. A landowner in the neighbourhood of Liverpool laid out his estate and built several hundred houses suitable for the working classes; and failing to come to terms with the Liverpool Gas Company in respect of the laying of mains to supply the place, which was known as "Klondyke," situated in the township of Orrell, he wired the houses for electric light, and supplied them from his own electric station, erected on the estate. The streets were lighted, and all the tenants supplied from dusk to midnight. In the four-roomed houses, there were two lights (I believe) charged in the rental of 6s. 3d. per week, and in the six-roomed houses (I believe) four lights charged for in the rental of 8s. 6d. per week. But the tenants were not able to do anything in the way of cooking and heating. This did not give satisfaction at all; and the landowner soon found his mistake in having made this venture.

Personally, I have great faith and hopes for the future prosperity of the gas industry. The latest returns are encouraging, and show a sure, steady onward progress, with every prospect of being greatly and widely extended, and, I trust, very long maintained.

EXHIBITION SHOW-ROOMS.

I think this will be the proper place in my short address to refer to the question of exhibition show-rooms—particularly with reference to the gas-fitting business, gas-cookers, and gas-fires. After a few exhibitions, which, as I thought, had been the means of educating the public sufficiently to appreciate the usefulness and economy of gas-cookers in particular, as well as the other inducements to the use of gas, in all classes of households, I considered that the time had arrived for opening a show-room at Llanelly; and this was done about two years ago. The show-room is also a depôt at which customers can call for information and assistance in choosing what they require. This department, as I said, has been open for two years, with satisfactory results to the Company, and great convenience, and at least equal

satisfaction, to our consumers. It is also an excellent and continuous advertisement, and has fulfilled my expectations in every way. I can recommend, with confidence, this practice to the careful consideration of everyone of you who has not yet taken this step. It is encouraging to find that manufacturers continue to improve their designs in gas-fittings, burners, lamps, cookers, and fires, and, at the same time increase the effectiveness and economy in lighting, heating, and cooking by gas. This is as it should be; and one way to assist makers and help ourselves is to exhibit their goods as freely and widely as possible.

SULPHATE OF AMMONIA.

The next point upon which I will touch is sulphate of ammonia. The decline in sulphate prices during the year cannot be attributed to over-production—that is, to any largely-increased production from any source. The material factor in bringing about a lower level in prices since May is the shrinkage in Japanese requirements since April and the absence of orders from Japan; while stocks are said to be fairly heavy at the ports of entry. As to the cause of shrinkage in the Japanese demands, I can only suggest that buying was overdone last year, when 6500 tons were sold, against 3200 tons for each of the two preceding years. Hence distributors are going about their business more cautiously this year. New sources of supply of nitrogen may have had something to do with preventing any general expansion in the consumption of sulphate of ammonia; but no exact information is obtainable on this point.

Since the close of the spring manure season, prices of all kinds of nitrogenous materials have declined; so that the present price for sulphate of ammonia is justified by the actual situation. And whatever may be in store for the new sources of nitrogen—the atmosphere and peat—they will not be the determining factors, in my opinion. The outlook, without attempting to prophesy, is that prices may be lower when the heavy—*i.e.*, the winter—production comes on. Our hope, however, lies in the growing demand for sulphate of ammonia to meet the needs of agriculture, in which there is not only an almost exhaustless field, but, as I think, an increasing desire on the part of farmers at home to avail themselves of this certainly most productive of all aids to the soil in the growing of seed.

It is much to be regretted that British farmers, up to now, have been so slow in recognizing the undoubted truth that sulphate of ammonia is probably the best fertilizer known at present, as well as the safest, and in the long run the cheapest. To-day, I think I am not exaggerating when I say that of all the sulphate of ammonia made in Great Britain, 75 per cent. is exported—chiefly to Japan and China. A local professional gentleman, who is not only eminent in his profession, but has for years been one of the most successful farmers in Wales, or, indeed, in the country, attributes his success in a large measure to the free and extensive use he has made of sulphate of ammonia as a fertilizer. If his example were more generally emulated by farmers, they would, without doubt, obtain equally satisfactory results.

THE PRICE OF TAR.

The market value of coal tar continues to be low and disappointing; the reason being that the demand for tar products, while continuing steady, does not keep pace with the rapidly increasing make of tar from gas-works and coke-ovens. Pitch is, of course, the product that affects the price of coal tar more than any other. Some few years since, when electric tramways were being laid down all over the country, there was temporarily quite a serious shortage of pitch, and prices ran up to a high figure; but since the electrification has been practically completed, pitch makers have had to rely upon the ordinary markets, and though trade has been steady in these directions, the increase has not been sufficient to absorb the extra quantity produced, and prices have fallen as a result.

Another factor that has had considerable influence on values has been the depressed condition of trade in America, which has reacted on the large railways in that country, reducing their earnings, with the result that they have had to very seriously curtail their expenses. These railways, which formerly laid down very few creosoted sleepers, have, owing to the exhaustion of their timber supplies, during recent years very generally adopted the practice followed in this country of using creosoted sleepers; and this extra demand gave a distinct lift to prices of creosote oil, which was shipped over to the United States in bulk as return cargo by the bulk petroleum steamers. During the past year, however, the United States have bought very much less. How long it will be before they again come into the market for large quantities it is difficult to say.

There appears also to be a greater amount of benzol and anthracene produced than there is a demand for—in fact, the whole question resolves itself into a search after fresh uses for the tar and its various products. The treatment of roads for dust prevention seems to point to a remedy for this depression; and though there has been an outcry in some directions that the tarring of roads is injurious to the surrounding vegetation, I do not think that this can be of such a serious nature as to prevent the further use of tar for the purpose, seeing that the difficulty has not arisen in this country, though thousands of miles of road have been treated. If the outlet for this purpose continues, then I think we may again see the price of tar rise to a more satisfactory level.

THE MINES EIGHT HOURS BILL.

The high price of coal has affected the gas industry throughout the country; and most gas companies have had either to trench upon their reserves or increase the selling price of gas to enable the payment of dividends. The most disturbing factor, perhaps, at the moment is the Coal Mines (Eight-Hours) Bill, now before Parliament, and which is likely to pass into law during the autumn session. Whatever happens, coal prices will not come down very much, if anything, for a while—this notwithstanding the general depression in trade. The Bill was, in my opinion, mainly the reason why this year's coal contracts could not be made at more than a slight reduction on last year's contracts.

I have endeavoured in the, I fear, already too long remarks I have made, to touch the fringe, so to speak, of a few of the most important questions likely to apply to the up-to-date progressive gas manager. I am, of course, sensible of the fact that you are all as alive as I am to the need for successfully competing with electricity, to the satisfaction of the consumer, as well as the shareholder; but if I understand the objects of the Institution aright, it is our duty, not only to keep ourselves equipped with the best and most serviceable information and experience for the discharge of our respective obligations to our respective directors and the public, but to go about from place to place, as we are doing to-day, and gain information from local centres of industry, which, though in some measure must of necessity be local as to character, yet, nevertheless, cannot but be of service to us as a progressive Institution, and, I hope, to the community as a whole.

I fear I have kept you rather too long already; but I hope you will bear with me for just a few minutes longer, while I say a last word upon a subject of absorbing interest which not only closely concerns us as gas engineers, but the community at large, without exception. This is the Coal Mines (Eight-Hours) Bill. For very obvious reasons, I cannot, and do not propose to, enter upon a political discussion; nor do I propose, personally, to offer any decided opinion, one way or the other, as to the probable effect of the Act if it becomes law. But I have gone to the trouble of ascertaining the opinions of some of those who are supposed to be leading authorities, for and against the measure. There is no doubt that the Bill is, as I have said before, mainly responsible for keeping up the price of coal, notwithstanding depression in trade, so that this year's contracts could only be made at little, if anything, below last year's. I have been able to obtain the opinions of the principals of some of the largest colliery undertakings in the Welsh coalfield. For obvious reasons, I am not at liberty to disclose their names; but were it possible for me to do so, you would know each of them, either personally or by repute

(A) "In the first place, there cannot be any doubt that it means a very considerable increase in the cost of production; and a greater increase will fall upon South Wales than any other mining district. Therefore, it will tend to handicap South Wales. Secondly, I think the effect at first on the selling price will be to increase it more than the increased cost of production; but I have very little doubt that this will soon wear off, and that the ultimate effect of the whole measure will be injurious to a number of important trades, and, as a consequence, the coal trade itself will have to bear some share of the injury done."

(B) "You ask me to make a shot at the effect of the Miners' Eight-Hours Bill. Well, in my humble opinion, the cost of production must of necessity be increased. I do not think anyone will seriously dispute this. Then, as to the selling price, I feel sure the price will be increased, because the production will be reduced. This, of course, will fluctuate; but on an average over years the price will be higher, and probably the reduced production, coming at a time when the output seems to be fast overtaking the demand, will rectify that state of things and give another boom in prices. That the Eight-Hours Bill will injure the coalowners I do not believe—on the contrary, it will enhance the value of collieries generally."

(C) "In the production of a commodity in which labour is the principal item, which is the case in point, reduce the number of hours devoted to its production, and one of two things is bound to happen, on the assumption, of course, that the labour hours at the present time are not wasted—wages will either be reduced or the cost of the commodity be increased *pro rata* to the number of hours reduced. Wages will not be reduced without a strike or a long struggle against circumstances tending to a reduction. The only alternative is the admission on the part of labour that labour hours are now utilized wastefully, and in the future this waste is to be corrected. But the Bill makes no provision in that direction; nor do I see how it is to be accomplished in practice unless men completely change their attitude, work more regularly, and be more impressed than at present by the inconvenience and loss incurred by their irregular work. I do not expect it. But I do expect an increased cost consequent upon a reduced quantity, and sooner or later an increased price for the coal at the expense of the carrying trade of this country. I know of no other fund where the increased cost is to come from."

(D) "If this Bill becomes law, I estimate the increased cost of production at 2s. per ton; and the selling price must go up more than this, as there will be a smaller quantity on which to make a profit."

(E) "In reference to yours of the 17th inst., (1) the cost of production will certainly be increased, and (2) the selling price of coal must necessarily follow."

(F) "There can be no doubt that the Eight-Hours Bill will increase the cost of production, but to what extent it may be difficult to say at the present moment. So many considerations influence the selling price of coal that it is almost impossible to foretell with any degree of accuracy how the passing of the Bill will affect the selling price of coal; but it seems that the only thing one can infer is that, other things being equal, an increase in the cost of production of coal must necessarily be followed by an increase in the selling price, if the colliery

owner is going to maintain his present position as a producer and seller of coal."

(G) "My views with regard to the Miners' Eight-Hours Bill are so well known they need scarcely be repeated. Still, I have no objection, if it helps your friends, to say that it is my honest opinion that it may possibly enhance the price of coal some 3d. or 4d. per ton, for the time it will take to bring the means of transit into good order—say, if you like, six months, no more and no longer. In all our large and well-equipped collieries whenever employers and workmen agree to do so, they can, and do, bring to bank easily 10 per cent. more coal than they ordinarily do. In fact, it will not take many months after the introduction of the Bill before every pound that is produced at present will be forthcoming in the reduced hours, and with the same number of men."

You will note that they are unanimous in declaring that the result will be an increase in the cost of production of the, to us, "raw material;" and, as usual, this cost has to come out of the pocket of the consumer. Now we, as representatives of our respective companies, are large coal consumers; and therefore if the Bill becomes law, and these predictions prove correct, it will be a very serious matter for us to face. A slight increase per ton in the price of coal means a large figure in the course of a year; and how is the lack of profit so caused to be made up? An increase in the price of gas will, perhaps, be put forward as a remedy; but to my mind a very great deal of caution should be exercised before resorting to this course. The first thing that most consumers do on the price of gas being increased is to economize more than ever. I have noticed that almost invariably, when the price of gas has been increased, there has been a considerable reduction in consumption, and, *per contra*, where the price has been reduced, there has been an appreciable increase in consumption. Further, as many companies now adopt the sliding-scale, an increase in price means a reduction in the rate of dividend paid. So we may thus defeat our object.

Having these points in view, I think we should consolidate our forces, and do all in our power to oppose a measure which is likely to prove so detrimental, not only to our welfare and that of our shareholders, but perhaps also to the gas-consuming public; for if the increase became so serious as 2s. per ton, as one gentleman assesses it, I am afraid there would be no other alternative than to put up the price of gas, if we are to show a profit at all. I must, however, say at once that I do not share this alarmist view; and after giving most careful consideration to the question, I am not satisfied that coal will cost more than 4d. to 6d. per ton beyond the prices that would otherwise obtain.

Vote of Thanks to the President—Present-Day Conditions of Gas Supply.

When the President resumed his seat,

Mr. Canning remarked that he did not rise for the purpose of discussing or criticizing the address. It was a good, old-established, and very proper, rule that the address of the President should be considered to be above and beyond all discussion. What he did wish to do was to propose that a cordial vote of thanks be accorded to Mr. Acland for his able address. It covered a great deal of ground, and was as valuable for what it suggested as for what it actually and practically entered into. He had gone over a very long list of subjects—economy in the consumption of gas, vertical retorts, gas-engines, general management of works and the Eight-Hours Bill for miners—and he had spoken upon them admirably. With respect to the question of economy in the consumption of gas, this was a point upon which he would like to enlarge just a little. People of the present day who were using the most modern incandescent gas-burner, were getting the same amount of light at about one-eighth of the cost that they themselves or their fathers would have obtained twenty years ago. That was to say, assuming that somebody paid 4s. per 1000 cubic feet for coal gas twenty years ago, he could secure an equivalent amount of light to-day for 6d. Now this had to be taken into account when they were considering the question of the price of gas. He agreed with the President that as far as possible they should avoid raising the charge for this commodity; and incidentally he might remark here upon something which he presumed had frequently formed for them as it had for him (Mr. Canning) a difficult question to reply to. The public often, understanding but little about the gas business, put this inquiry; and a very reasonable one it seemed: "While gas is very much the same all over the kingdom, why is not your gas sold at as low a price as is the case in some other districts?" Though they might be perfectly conscious that their capital costs were all quite right, and that they were making gas at a low price into the holder—perhaps even lower than someone else who was selling gas cheaper—it was important to remember, and the public too should know it, that the conditions attaching to various towns were so different that it was an impossibility to have a uniform price of gas. It arose from this: If they took the view of a large works—say, a tinplate works, or an iron or steel works—what did the proprietors and managers of them do? They set the works down in the best and most suitable places for them—where they could buy the raw material cheapest, and have their wages bill as low as possible, and where they could get a good market. They must remember a gas undertaking had no such choice; one had to be set up in every town. A gas-works might be in a district where the market for gas was good or bad; it might be in a district where wages were high or low; it might be in a district where the consumption of gas was double per mile of main what it was in another district; it might be surrounded by a variety of circumstances which there was no need to go into then; it might be in an industrial, a residential, or a mining town, or a seaport, or a combination of all these. All these points affected in a substantial degree the price of gas; and there was one other—one other that ought to be got rid of. He referred to the imposition at the present day of an antiquated standard for testing gas. The quality now supplied in various towns was very different; and there was a perfect anomaly in the existing state of affairs—namely, that in one town the standard for gas was (say) 14 candles tested by an improved burner, the No. 2 "Metropolitan" or the "Carpenter" burner, and perhaps in the next town the standard was 15 candles tested by an old, and what should be an obsolete, burner, the No. 1 "London" argand. There was a difference of 4 candles between these two towns; and it was a surprising thing to him that this state of affairs should be allowed to continue, and that what was good enough gas for the Metropolis should not be considered good enough for certain parts of the Provinces. He would also go the length of saying that he thought a quality of 14 candles, tested by the most improved burner, should be the standard; and it should be made universal. He was in hopes that Mr. Lloyd-George would have remained longer at the Board of Trade; and if he had done so, he (Mr. Canning) thought that, with his very clear insight and his practical common sense, he would have seen the advantage to the public of having a uniform standard, and one such as he had just indicated, for the whole of the country. It would certainly tend to reduce the price of gas in a great many places. In referring as he had done to Mr. Lloyd-George, he was not, of course, speaking politically, but merely of him in his capacity as a very able President of the Board of Trade. Sometimes local authorities considered themselves only benefiting the public if they insisted upon the older standard; but in reality, instead of assisting or defending the interest of the public, they were retarding it. Another point he noticed in the Presidential Address was with reference to the Coal Mines (Eight-Hours) Bill. He thought there could be no doubt whatever Mr. Acland was right in anticipating an increase in the price of coal. This would be so; but at the same time they themselves could take some advantage out of that. They could still further push their developments for cooking and heating by gas; and he hoped that in this way they might render it so much more economical to use gas in case the price of coal went up high, that in some degree they might be compensated for the additional rate they would have to pay for their supplies. Certainly they would have to pay more for their coal as soon as the Bill came into operation; and this state of affairs might continue for some time. The way he had indicated would be one method of meeting it. Reverting again to illuminating power, of course, the ideal system of distribution and sale of gas would be that undertakings should be allowed to produce two qualities of gas—one for heating and cooking, and the other for lighting. But, unfortunately, they had not been able up to the present to devise any practical method by which this idea could be carried out. Therefore it seemed to him that it was in the interest of the public generally that the high and severe standard of testing that had been in operation for a long time should be reduced to one uniform standard all over the kingdom such as he had already suggested—namely, 14 candles, tested by apparatus from which all possible fluctuation would disappear, and by a burner that would develop, and not destroy, the illuminating power of the gas, so as to show its value correctly. They were all deeply indebted to Mr. Acland for the interesting address he had delivered. He was quite sure that great notice would be taken of the remarks in the latter portion, where Mr. Acland gave so lucid a view, and so many variable opinions, with respect to the anticipated operation of the Eight-Hours Bill for miners, assuming it should pass into law. He therefore had no hesitation whatever in asking the members to accord to Mr. Acland a very hearty vote of thanks.

Mr. R. A. Browning (Neath) seconded the proposition, with the remark that it was a most useful address, and one that would repay careful study.

The motion was carried by acclamation.

Paper Read.

Mr. J. Mogford, of Briton Ferry, then read a paper entitled "Some Notes on the Gas Supply of West Glamorgan." The paper, together with a report of the discussion to which it gave rise, will be found on the next page.

Place of Next Meeting.

The President said they had now to decide upon the next place of meeting. He had at first intended to suggest Aberystwyth; but having regard to the long distance members would have to travel, he thought perhaps it might not be approved of. He would therefore propose that the next meeting should be held at Barry, which all the members could reach without a long journey.

Mr. Browning seconded this, and it was agreed to.

Thanks to the Urban District Council.

The Hon. Secretary said there was one other item—the passing of a hearty vote of thanks to the Chairman and members of the Llanelly Urban District Council for the use of the Town Hall for the meeting. He had pleasure in proposing this.

Mr. Canning, in seconding, remarked that they were much indebted to the Council for their courtesy in affording the Institution such admirable accommodation. It was a very fine Council Chamber. They could congratulate Llanelly in having not only

a courteous Council and good Gas Manager, but also on possessing an excellent Town Hall.

The PRESIDENT said he had to express the regret of the Chairman of the Council (Mr. W. Bramwell Jones) at his inability to be at the meeting. He was, however, prevented by circumstances over which he had no control. He would also like to mention the kindness the Town Clerk (Mr. H. W. Spowart) had displayed in trying to make the gathering as successful as possible by suggesting places of interest which, had time permitted, they might have visited, and also in sending a booklet round to the members which gave a good idea of the town of Llanelly and district.

The vote was carried by acclamation.

LUNCH WITH THE PRESIDENT.

At the conclusion of the meeting, the members returned to the Stepney Arms Hotel, where they were hospitably entertained at lunch by the President, who announced that he had just received a telegram from Mr. W. L. Williams, the Member for the Carmarthen District, regretting his inability to be present. A few toasts were submitted; but this portion of the proceedings had to be kept as short as possible, owing to pressure of time. After the Loyal toast had been honoured, Mr. R. A. Browning proposed "The Town and Trade of Llanelly," remarking that he hoped the present industrial prosperity of the place would continue for a long time to come. In reply, the Town Clerk said they were pleased to welcome the Institution to Llanelly, and to be able to place the Council Chamber at the disposal of the members for the meeting. Mr. D. Rees Edmunds submitted "The Wales and Monmouthshire District Institution of Gas Engineers and Managers," coupling with the toast the name of the President. He said that, as a Llanelly man, he regarded it as an honour that, in the early days of their existence as an Institution, they should have chosen the town as one of the places of meeting. He looked upon Llanelly as a typical South Wales town; and he did not think he was exaggerating when he said that at the present moment not only was trade flourishing, but they were more independent of any particular industry than had ever before been the case. It was a good plan on the part of the Institution to visit different places; for in this way they made known to the public, not only that there was such an Institution, but that the members were bent upon supplying gas as cheaply as possible. The President, in response, remarked that he had greater faith now than ever in the future of the Association. It may be mentioned that among the prominent local gentlemen present at the luncheon was Alderman David Evans, J.P., D.L.

VISITING THE STEEL AND TINPLATE WORKS.

On rising from the table, the members proceeded by brake to the works of the Llanelly Steel Company, Limited, where they were welcomed by the Secretary (Mr. R. W. Evans), who at once handed them over to Mr. Crosby, the Manager, Mr. Harold Trubshaw, the son of the Chairman, and Mr. Macdonald, the Chemist. Under such able guides, they were afforded an excellent opportunity of witnessing the process of converting cast iron into steel bars. The party fortunately arrived just in time to see the tapping of a furnace holding about 30 tons; the mass of molten steel being poured into a huge ladle, from which it was run into ingot moulds containing about 15 cwt., and subsequently rolled into bars. Six furnaces are now in operation; but the erection of new works will shortly double the capacity. All the furnaces are charged electrically, instead of by hand. After the bars are rolled, a crane places them on a trolley, which takes them to the tin works, where the operation of plating with tin is carried out. This portion of the process the members were subsequently fully made acquainted with by a visit to the Old Castle Tinplate Works.

THE GAS SUPPLY OF WEST GLAMORGAN.

By J. MOGFORD, of Briton Ferry.

[A Paper read before the Wales and Monmouthshire Institution of Gas Engineers and Managers, Sept. 30.]

The gas supply of West Glamorgan is provided by eleven works, with an aggregate output of 648 million cubic feet. One works has an output of 450 millions per annum, another of 100 millions, and each of the remainder would make from 35 millions down to 4 millions per annum. Six works are owned by companies, whose outputs aggregate 466 millions per annum, as against 182 millions provided by local authorities. The larger works having been dealt with in previous papers, it occurred to me that some notes dealing in a general manner with the supply provided by the smaller concerns to the remainder of the district might prove interesting, and also lead to a discussion which would be of interest and value to those in charge of the smaller concerns. The subject of this paper was suggested to me by a paragraph in one of the technical journals, in which it was said that the writer understood the practice in small works was to charge the single retort, make up the fire, and leave the works to look after itself while the manager went fishing. It has never been my pleasure to meet this happy individual; and possibly the following account of the conditions which prevail in small works may help to prevent a mad rush for these ideal appointments.

The duties which fall to the lot of the manager of a 4 million to 5 million feet works are numerous and varied. He is often stoker, fitter, service-layer, meter inspector, and general manager, as well as assistant secretary. It is a source of wonder to me how any physical constitution can stand the strain of drawing and charging retorts in the morning and service-laying in the open for the remainder of the day. The kind of man I have found best able to perform such work is the wiry, hard type, of medium height, brought up to the duties from youth. But the species is growing scarce. I have by me a letter from such a man, in which he describes his daily routine; and the following extract will prove that he has but little time for fishing: "The generator furnace is quite a success. I charge three retorts at 8 o'clock in the morning. Then I go on general repairs. I partly close the damper of the main flue at dinner time. The night charges are put in at 7 o'clock; and I damp-down again at midnight." The writer of the letter was born and reared in a gas-works, has managed small works on the Continent and at home, and has been in charge of his present works for many years—spending his life as his father did before him. When the services of a man of this kind can be obtained, with an occasional visit from a neighbouring engineer for consultations, he will keep his works in good order and pay a regular 5 per cent. dividend. The furnace mentioned is one well adapted for small works. It is inexpensive, does not demand the constant attention of the man in charge, and it allows the floor level to be such that coal and coke can be handled with convenience. This description applies to the method of working during the lighter months. When the repairs would entail heavy work, he would obtain the assistance of a labourer, and for the winter a night stoker would be engaged, and the furnaces kept in regular work over the 24 hours.

The chief source of worry in very small works is usually the condensing and scrubbing plant. You will frequently find the condenser close to, or upon, the hot wall of the retort-house, and the scrubber either in disuse or its water supply of an intermittent, spasmodic character. The liquor is seldom or never utilized. Lime is generally used for purifying; but provided the purifiers are of sufficient capacity, I have found oxide cheaper and cleaner. The manager's salary in a 4 million to 5 million feet works is from 30s. to 32s. 6d. per week, with house, coal, and gas free. The house is provided presumably to keep the manager in close attendance; but I have also known it to act as an inducement for his wife to share his labours.

The conditions appertaining to a gas-works making between 20 million and 30 million feet per annum are slightly different from the foregoing; but the man in charge of such a concern needs to be more cosmopolitan than his *confrère* in the smaller works. It would be well for him if he had been trained in accordance with the specification suggested by the Institution of Civil Engineers some years ago, as it is essential that he should not only know what is required to be done, but also be able to instruct his men in the best method of carrying out his requirements. A man who has been trained on a medium-sized works should feel at home in such a position; and if he has acquired the happy knack of managing men, and has a good commercial knowledge, he is certain to make a successful manager. I consider the latter qualification essential. The man in charge of a concern of this size, which is probably growing rapidly, would need to be a good buyer, capable of utilizing his capital to the best advantage, and of swelling the balance of his revenue account by purchasing in the best markets at the best prices. It is not much use a man spending his time in the retort-house watching carbonizing results, unless he keeps an equally keen eye on the purchasing of coal and other commodities.

My experience at a 30 million feet works may be of some interest. I entered on my duties in the fall of the year 1897, and found the works in a bad condition. They were being heavily subsidized from the rates, and had evidently been "starved" for some years in order to make the balance-sheet more favourable. The lighting season was just commencing; but nearly all the retorts were already under fire. The condensers were leaking badly on the inner tubes; the exhauster was most erratic in its behaviour; and the side plates of the purifier covers were so badly corroded that the water-lutes had been filled with slates and lime to prevent the gas escaping. After a thorough inspection, I reported that it was urgently necessary to put the place in a good state of repair, and suggested that a consulting engineer should be called in. This latter recommendation was met with the simple rejoinder, "If you cannot run the concern, we must get someone who can." This reply strongly impressed the writer; and he is hardly likely to forget it. The next day the whole of the flues were cleaned out, dampers adjusted, and the main flue made air-tight. This had an immediate effect upon the furnaces. The heats improved; and we were able to shut one bed down. While engaged on this work, I noticed a man running tar from the hydraulic main into a bucket. To my inquiry as to why he did it, he replied that he did it twice every day, as there was no other way to get the tar out. At the earliest opportunity I replaced this man and his bucket by an arrangement similar to that described by Dr. H. G. Colman in his recent lecture to the Irish Association. The only marked difference between Dr. Colman's arrangement and mine was that he has only one regulating device to serve the whole of the beds, while I had a nipple for each, and my balancing pipe was connected to the tar-pipe instead of to a box. New covers were purchased for the purifiers, and the inner tubes of the condensers were patched temporarily; new tubes being inserted the following summer.

Map of West Glamorgan—Showing the Gas-Works, the Electrical Stations, and the Railways.

The exhauster still remained a source of worry; and it was quite a common occurrence to be called out in the night to find that the exhauster would not "pull," that a self-acting syphon was blowing, or that the only gas-engine had tired of its perpetual motion, and was resting. I got no relief from this until the engine was duplicated and the exhauster replaced by modern ones, also in duplicate. Our furnaces are still direct-fired.

After putting the works in order, I turned my attention to the sales department. The liquor had always been allowed to run into the drains, and tar had accompanied it until the town surveyor discovered it. A market was found for both these residuals, and the wells emptied. The number of consumers was small, and there were only about a dozen cookers in use. The capital per million stood at £1500, and the gas consumption had fallen into ill-repute. The holding of a few exhibitions and the introduction of slot meters soon wrought a change; and to-day nearly every householder uses gas for lighting and cooking. The capital has been reduced to £670 per million. We have been able to reduce the price of gas by 3d. per 1000 cubic feet, and also to build up a little reserve out of the profits. To attain these results, I have had to look after my "load-factor" as assiduously as does an electrician; and we have now so many cookers in use that our consumption varies but little during the 24 hours.

Of late years, I, like others, have been severely handicapped by the high prices of coal and labour. Glamorganshire boasts, and I think rightly, of her steam coals being the best in the world; but, as most of us know through experience, the so-called gas coal which is wrought locally is greatly inferior to that of the North Country, and yet its price fluctuates with that of the best steam. A recent incident in my experience will illustrate what South Wales managers have to contend with in the coal line. I agreed to test a sample of what was offered as best gas coal. A good, clean sample of large cobbles was delivered; and it looked as if I had found the right thing. My men failed to get gas out of it; and I naturally blamed them. In the next day's paper I read how this same coal had enabled a steamship to travel one knot per hour more than she had attained on other coals. Needless to say, I had to apologize to my men, as they could hardly be expected to make gas satisfactorily with best steam coal. My only reason for using local in preference to North Country coal is that it requires less handling, and can be obtained freshly wrought when required.

The wages problem is one that affects us all; and I have often thought that it would be well for the industry as a whole if local associations of gas manufacturers so framed their rules that meetings could be held to discuss matters of common interest, in the same manner as is now done by coalowners, tinplate manufacturers, founders, steel manufacturers, and other employers of labour. I am not an opponent of Trades Unionism—in fact, I consider it is the right of every man to get as much as he can for his services, whether such services be physical or mental. The object of such meetings need not be antagonistic to the interests of Trades Unionism; but they might help to fix a definite rate of pay for the different grades of men employed on a gas-works, so that men and managers might have a common understanding as to the rates to be paid. There would be no more difficulty in doing this than is experienced by the coalowners, whose rates vary according to the vocations of the men and the characteristics of the seams they work in. Personally, I get no trouble with my men. My rule is to pay them the same rate as my larger neighbours; and though this method runs up my costs, I find it creates harmony, and pays in the long run. Some of you will probably say that the larger works can get over this difficulty by introducing machinery, and that the smaller works must fight their own battles. Such a policy may be successful for a time. But there is a possibility of the small works becoming, unintentionally, agents in increasing the working costs of the larger ones. Supposing that I should (and as a matter of fact I do) grant my men advantages which are denied at larger works. The concession costs me but little, because my men are few; but it will in time become a recognized custom. The employees on the larger works will sooner or later demand the same concession, which, though insignificant on the small concern, may be a serious matter to the larger one.

There can be no doubt that such meetings would be useful, as the present want of uniformity is manifest from the number of letters of inquiry received on the subject. My Gas Committee is composed of capitalists and labour members; and I have always found it easy to settle any petty dispute with my men, and that labour members expect nothing more from their manager than that he should manage his concern with a firm hand and deal out to the men evenly balanced justice. They demand that the Union rate of wages be paid; but it is often difficult to find what this rate is. Other objects of such meetings might be the discussion of prices and means of disposing of residuals, and methods of meeting electrical and other competition.

In the year 1899, we were threatened with competition from the South Wales Electrical Power Distribution Company. My Council opposed the Company's Act of 1900, but were only successful in securing the insertion of certain protective clauses. The Act, as passed, gave the Power Company permission to supply electricity in our district if the Council were not in a position to do so. I was requested to report to the Council on the advisability of their laying down an electric plant, and had no difficulty in convincing them that gas was the better illuminant. However, in face of the fact that we could only keep the Power Company out by ourselves becoming suppliers, it was decided that the Council should make provision to supply electricity, as the better course, and the lesser of two evils. A Provisional Order was obtained, and an agreement was entered into with the Power Company for a supply in bulk. A transforming station was erected at the gas-works, and a distributing plant laid to supply the streets scheduled as a compulsory area in the Provisional Order. We had hardly completed this work when the Power Company found they were in financial difficulties; and we are left in the peculiar position of having a complete electrical distributing system and no source of supply.

The transformer station was erected at the gas-works in anticipation of such an emergency. The Council recently proposed generating by means of gas-engines at the gas-works; but in the meantime the intending consumers had changed their minds. The Power Company had already erected their generating station for supplying West Glamorgan, and were supplying current to a neighbouring Rural Authority when trouble overtook them. This Local Authority have now purchased the station. There has been considerable rivalry between us in lighting matters; and the result has been a stronger argument in favour of gas than pages of figures or statistics.

It is easy to convince a council, by means of figures concerning candle power, watts, units, and cubic feet, with a few decimals of a penny thrown in, that gas light is cheaper than electric light; but the man in the street requires something different. You need to appeal to his sense of sight. Always maintain your public lamps at a higher power than the nearest electric lamp, and you will command his attention. Outshine your rival; and the public will be more willing to entertain your figures as to costs.

The present methods of gas distribution in West Glamorgan need little comment. Outside the two largest towns, each small works serves its own limited area with gas at a comparatively high price. Looking at the map, one cannot help noticing the contrast

between our method of supplying gas to a district and that which was described by Mr. R. M. Searle, of Rochester, New York, at the meeting of the Institution of Gas Engineers held last year in Dublin. The American links up a large number of towns with a high-pressure pipe-line 100 miles long, varying from 8 inches to 2 inches in diameter, and consolidates the manufacturing process in one station. He can thus reduce his manufacturing costs to a minimum, utilize machinery for all arduous work, and have his residuals ready to hand for converting into marketable commodities. We, on the other hand, who have a district naturally suited to such a scheme, are content to light isolated areas at high prices, getting little for our tar, and, in most cases, nothing for our liquor, leaving large tracts of the district to the electrician, and other parts to the enterprising company promoter. The populous district of West Glamorgan is naturally fitted for such a system of distribution as that mentioned by Mr. Searle. From the map it may be seen that the railways of the district converge on Swansea Bay. Each railway serves a separate valley; and their positions roughly indicate the general configuration of the district.

I venture to suggest that if this district were supplied from a central station at Swansea by means of a distributing system such as that mentioned by Mr. Searle, the present consumers could be supplied more cheaply, and a greatly increased consumption attained by supplying the several large villages, isolated hamlets, and mansions that are at present unprovided with a public lighting service, or are indifferently lit by carbon filament electric lamps. There is, again, another feature which makes the district peculiarly adaptable for a cheap gas supply. Swansea has a world-wide reputation as a metallurgical centre; consequently there is a large demand for oven coke. There are at present 200 coke-ovens in the district; but their output is insufficient to meet the local demand. These ovens carbonize about 130,000 tons of coal per annum, no bye-products are obtained, and the surplus gas is utilized under steam-boilers. From the extravagant manner in which this large volume of gas is consumed, there can be no doubt that a system of supply combining the oven method of carbonization with high-pressure distribution would be much more rational than the present one. Such a system would enable the district to be supplied at a price that would prove an insuperable difficulty to the electrician, and would ensure gas being the principal agent employed for heating, cooking, and lighting.

Discussion.

The PRESIDENT, after thanking Mr. Mogford for his paper on behalf of the Association, remarked that it was a useful communication, and one which would set them all thinking. When he stated that there were 131 gas-works in Wales and Monmouthshire completed, and two others not yet in a position to make gas (Caldicot and Llandrindod Wells), and that seven of the larger works made slightly over half the total quantity of gas made by all the works, they would see that there must be a very large number of small works such as had been referred to by the author. Many of them, indeed, were what might be termed "one-man power" works—where a man had to work 24 hours a day when necessary. Regarding the supply of several towns from a centre, as practised in America and he believed in one or two places on the Continent, this was a custom which he did not think was likely to prevail in this country to any large extent. Great Britain was a coal-producing country; whereas American places in the prairies were away from any source of coal whatever. Another factor was that America was an oil-producing country; and altogether the manufacture of oil gas, water gas, and coal gas at one large centre, and its distribution in small diameter high-pressure pipes, was more practicable in the States than it was ever likely to be found in the United Kingdom. As to the remarks respecting the probability of the electric light affecting the gas industry, he did not think that the time had yet come when they might seriously consider themselves as strongly attacked from this source.

Mr. A. W. BRANSON (Rhymney and Aber Valleys) said it seemed to him that the key-note of the paper was the question of distribution under pressure and the use of coke-oven gas. If anywhere these systems could succeed, it should be in South Wales. He served a Company having a very big area—about 60 square miles—and the matter appealed to him most strongly. They had recently tried the use of coke-oven gas; and it might be of interest to the members to hear what their experience had been during the past six months, over which time they had made careful experiments with such gas. He would advise others to go on somewhat the same lines. They enriched the gas with benzol, and then passed it through a freezing mixture to test its carrying capacity; and after this treatment and three days' subsequent storage, they found that the gas did not drop the benzol. This was, of course, a very severe test. The success of the use of coke-oven gas, to his mind, depended upon the conditions under which it was purchased. If there were no bye-products recovery plant attached to the coke-ovens, the gas would cost a great deal more to purify than coal gas. There had been experiments with coke-oven gas in the North which had been a failure because of the absence of bye-products works in connection with the ovens. Rightly used, however, coke-oven gas as an illuminant was a thing which had a future before it—especially in the South Wales district. As he had already remarked, his Company had started to use it, and had continued to do so for some six months, with success. They had the gas delivered to them of about 7 to 8 candle power, and by means of benzol brought it up to 15 candles; and they were making arrangements to take bigger quantities in the future. The only drawback to it was that, with its use, it was necessary to have some sort of stand-by plant to rely upon in the event of a stoppage of the coke-ovens through a strike. Gas undertakings must not run the risk of depending entirely on coke-oven gas. This year his Company had put in from 400 to 500 slot-meter installations, with incandescent burners, on coke-oven gas; and the results had been quite satisfactory. The coke-oven gas was supplied in the Bargoed to Hengoed districts; and since its introduction the price of gas in this area had been reduced 9d. per 1000 cubic feet. The question of high pressure was an important one to this district; and what they had carefully to consider was how far they could go in this direction to make it pay. In America they had long runs of main, and used very high pressures in order to save capital outlay; but how far such a policy would pay in this country, with comparatively short lengths of main, was the problem they had to solve.

Mr. THOMAS CANNING (Newport) complimented Mr. Mogford on his paper, and remarked that his history of the transformer station erected at a gas-works was one of the most interesting things they had had before them that day—especially the part where the author said: "The Council recently proposed generating by means of gas-engines at the gas-works; but in the meantime the intending consumers had changed their minds." Just so; and this was what the consumers of electricity were doing all over the country. They had changed their minds a good while ago in the North of England. They had also changed their minds very largely in the Metropolis; and if one cared to inquire to-day of the managers of the gas-works in any of the suburban districts of London, "How do you find electrical competition affecting you now?" the reply would be, "In no degree like it has done in the past." People took to using electric current for lighting first of all because it was more or less of a novelty, and among those who liked to be fashionable it was considered the proper thing to do; and, secondly, because they had been promised two things, which, however, were never fulfilled—namely, that it should be a better light than gas, and that it should be cheaper. It was not better than gas as now developed; and it was not cheap. Therefore they had repeated that day down in Glamorganshire the tale which he had heard in London and elsewhere—that on the question of the value of electric lighting people were changing their minds. With respect to distributing gas from a centre over West Glamorgan under high pressure, he might say (having had considerable experience himself in sending gas out under this system) that there would be no insuperable difficulty in the way. They must remember, however, that in most of the districts in America where high pressure had been introduced there were very wide stretches of level, or nearly level, country. Glamorganshire, like Monmouthshire and all the mining districts of South Wales, was cut up into long valleys with hills between. But this matter seemed to be met by the author's proposal that the central station for distribution should be fixed at a point on which these valleys converge—namely, Swansea Bay; and that the radiation of the distribution would be from there to the different valleys. This might be a solution of the difficulty; but then, of course, there would after all be a number of separate mains. However, the question was worthy of deep consideration; and it was one about which it would be impossible to express a definite opinion straightaway. It required thought; but every member would, he was sure, agree that it was a valuable, indeed he might say a vast, suggestion. It was entitled to serious consideration at their hands, and at the hands of all interested in gas.

Mr. J. M. SMALL (Merthyr Vale) expressed appreciation of the paper. Other members, he said, sometimes encountered the difficulties which the author had had to go through; and what was stated would be very useful to them.

Mr. MOGFORD, before replying to the remarks that had been made, thanked the members for the way in which they had received his paper. He remarked that they had to fight all kinds of opposition; and he endeavoured when possible to put in the first blow. When he commenced writing the paper—which had been prepared very hurriedly at the request of the Secretary—he had in mind the fact that for coke-oven gas to be distributed with any degree of success, coke must be the essential product, and the gas must be a bye-product, with tar, ammonia, and other things; otherwise the difficulty suggested by Mr. Branson was bound to occur. They as gas suppliers had to keep up a constant supply; whereas the coke-oven people, not being under parliamentary jurisdiction, might close down a part of their works, and so shut off the supply of gas. If coke was the essential product, there was hardly any likelihood of this happening; and in the Swansea district, where there was a great demand for coke, he thought the conditions would be almost ideal for such a system. The President had suggested they were not very strongly attacked by electricity; and Mr. Canning thought that they could well hold their own. Personally, he (the speaker) liked to look his enemies straight in the face. It was useless for them to try and persuade themselves that they had simply a small competitor in electricity, because in that district they were already well met. Anyone going into the valleys would find they were studded with small but rapidly growing villages. The top ends of the valleys were in the heart of the anthracite district; and the villages wanted light of some kind. If they offered, as he had done, to put down small gas-works, they would immediately be met by half-a-dozen

electrical engineers from Swansea, and Cardiff, and other places. These gentlemen would at once propose a scheme for generating current, by means of suction-gas plant, with the anthracite that was ready at hand; and it was often difficult to persuade the people in these valleys that they could do better with a gas supply. He had marked on the map the already existing supplies of electric light. Not only had they to meet future supplies, but even now there were several small installations which shut them out from these particular villages. The western fringe of the district was, with the exception of one village, monopolized by company promoters who had had considerable attention from the technical journals of recent times. It was one valley containing a large number of little, rapidly growing villages. With the exception mentioned, the whole district was unprovided for. The top end of the Swansea Valley was supplied by the Swansea Valley Gas Company. The valleys were not absolutely separated by mountains; and in only one or two instances would it be necessary to run a blank main a mile or two in length over the mountain line. Though the South Wales Electrical Power Company came to grief, the thing was not defunct. It was more alive than ever it had been. The power station to which he referred—built at a cost of £40,000—had been purchased by the local authority for £7000; so that they had secured with a very small capital outlay a station worth a large sum. The authority had power over practically half the area shown on the map; and though at present they were not supplying more than a limited district, they were gradually developing their area by lighting up the villages from neighbouring collieries. Thus they were building up a large scheme in a quiet way; and eventually from a central station they would be distributing at high pressure, and would have taken up a very valuable field which was at present open for gas lighting. To his mind, unless such a scheme as he suggested was inaugurated in the next ten years, they would find, not that electricity was dying, but that it was very much alive.

The PRESIDENT remarked that there was a lot to be said on both sides. There were certain districts which undoubtedly were likely to be lighted by electricity in which gas was not at present in use. Every gas undertaking was surrounded by its own special peculiarities; and each manager must work out his own salvation. In no two gas areas were the conditions precisely similar. He again thanked the author for his paper.

THE STRACHE WATER-GAS PROCESS.

A paper by Professor H. Strache, of Vienna, referring to the introduction of his process of water-gas manufacture into Germany, was presented at the last meeting of the Association of Gas and Water Engineers of Austria-Hungary. It has been published in the "Journal für Gasbeleuchtung," and some particulars of general interest may be quoted.

The essence of Dr. Strache's process is the maintenance of a particular temperature in the water-gas generator. It has been established that at low temperatures the efficiency is low because the decomposition of the steam is incomplete, but that it rises rapidly, and attains a maximum of about 75 per cent. at about 800° to 900° C. At higher temperatures the efficiency falls off again, owing to the large quantity of heat carried off through the chimney-stack. The efficiency of a water-gas generator is expressed by—

$$\frac{\text{Calorific value of 1000 cubic feet of gas.}}{\text{Pounds of coke consumed to produce 1000 cubic feet of gas} \times \text{Calorific value of 1 lb. of coke.}}$$

A high efficiency can only be attained if the temperature of the generator remains sufficiently high; and the customary method of alternating "blows" and "runs" of fixed duration precludes the maintenance of a particular temperature in the generator, for the reason that the quantity of air introduced in the "blows" is affected by a number of contingencies, such as the size of the lumps of coke and the presence of clinker, while the heat taken up in the "runs" varies similarly with the rate of flow of the steam and certain other conditions. The Strache process aims at keeping the proper temperature in the generator by the use of a steam-pressure governor and steam-nozzles of a size proportioned to the diameter of the generator. The "runs" are then interrupted as soon as the decomposition of the steam ceases to take place properly. The time for stopping the "runs" is ascertained by means of an indicator which operates in the following manner: A throttling-disc is placed in the gas-main from the water-gas plant to the holder near the inlet to the latter. Thus the pressure on one side of the disc is practically constant, being that thrown by the holder; while the pressure on the other side of the disc depends on the quantity of gas made and passed through the disc per minute. This pressure is transferred by means of a small pipe to a small double-walled bell. Such a bell has the characteristic of standing at different heights according to the pressure within it, while the quantity of water displaced is different at its varying heights. This combination admits of the make of gas per minute being ascertained forthwith from the height of the bell. A pointer travelling on a moving scale serves to record continuously how many cubic feet of gas are made per minute.

Applying this indicator to the ordinary water-gas generators, it will be found that at the beginning of the "run" there is a high make per minute, while after the "run" has proceeded for a short time there is a very rapid decrease in the make, which ultimately falls almost to *nil*. That is to say, at the commencement of the "runs," much more gas is produced from the same quantity of steam than at the close; or, in other words, much steam escapes undecomposed from the generator towards the end of the "runs"—95 to 100 per cent. of undecomposed steam having in many cases been detected at the close of the "runs." This could be avoided by stopping the "run" as soon as the indicator shows a low make of gas per minute. By means of an electric contact, the indicator may be made to ring a signal-bell as soon as the make becomes too small. Thus the procedure would be for the operator to open the steam-valve fully each time, and then as soon as the bell sounded to shut off the steam, and "blow" for the prescribed time. The temperature of the generator could thus be kept practically constant without further trouble to the operator.

It is clear that if the "blow" is too brief, the subsequent "run" will be rapidly brought to a close through the early sounding of the signal-bell. That is to say, the heat stored up through the "blow" would only suffice to produce a limited quantity of gas. The operator has simply to heed the signal-bell, and he can dispense with observations of the pressure, meter, &c. The duration of the "blow" has a determined influence on the efficiency. With long "blows," the range of temperature at which the "runs" proceed becomes very large, and the efficiency is rather low. It is better the shorter the duration of the "blows;" but obviously they cannot practically be shortened beyond a certain limit. The efficiency is also reduced if higher heats are used in the generator with a view to increasing the make of gas per hour through the decomposition of more steam. There is a certain reasonable limit to the output of each generator. It would be useful if makers of water-gas plant would state the productive capacity of the generator per square foot of its clear cross section. In many plants of various systems in which the Strache mode of operating by means of the indicator and signal-bell has been introduced, great variations in the productive capacity per square foot of cross section have been found. The make has ranged from 440 to 3300 cubic feet per hour per square foot of cross section of generator.

The velocity of the blast used in different plants and systems varies greatly. It has been found by the author to range from 1½ to 4½ feet per second on the clear section of the generator.

No.	1. I.	2. II.	3. II.	4. II.	5. II.	6. III.	7. III.	8. IVa.	9. IVb.
System									
Depth of fuel bed, feet	9·8	6·5	4·6	5·9	..	5·9	..	7·5	5·5
Velocity of air-blast, feet per second	4·59	1·93	2·29	3·28	..	1·64	..	3·60	2·23
Nominal productive capacity per square foot clear area of generator, cubic feet per hour	3310	820	770	740	1380	1210	..	1210	520
Problem	Reduce CO_2, increase make	Reduce CO_2, ..	Improve make, reduce CO_2.	Reduce CO_2 ..	Raise duty, reduce undecomposed steam.	Raise duty for same make.	Reduce CO_2 ..	Improve make.	Reduce CO_2, improve duty.
Results Achieved.									
CO_2 Before use of indicator, p.ct.	..	8·1	..	6·5	6	..	9·6	5·0	6·0
CO_2 After ,, ,,	1	2·8	..	3·0	2	3	4·3	2 5	3·5
Increase in make, p.ct.	29	6·8	..	18·0	..	..	..	13·0	..
,, duty, ,,	—	5·7	..	.	100	20	..	..	..
Thermal efficiency ,,	—	—	71·7	..	..	..	..	75·7	60·0
Other points	Productive capacity per square foot, 1575 cub. ft. per hour.	Condensing water reduced to one-third former quantity. Coke, including boiler fuel, reduced by 11·9 per cent.	Comparison with former conditions not made.	Steam used reduced to 30 lbs. per 1000 cub. ft. of gas made.	Undecomposed steam at end of run reduced from 80-100 per cent. to 20-30 per cent.	..	11·6 per cent. of oil saved; steam used reduced from 40·6 to 23·7 lbs. per 1000 cub. ft.	..	..

Dellwik plants did not have the highest blast velocity, although that is specially claimed under their patents. Further, a high velocity of the blast was not always found to be advantageous, and in many cases it had to be reduced in order to obtain the most favourable results. Naturally, a high blast carried more heat into the chimney, as the temperature of the flue gases is higher the greater their velocity. On the other hand, too low a blast velocity detrimentally affects the productive capacity per hour. Generator makers might with advantage state the velocity of the blast calculated on the clear cross section of the generator. The height of the bed of fuel also has marked influence. Generally speaking, a deeper bed gives a higher efficiency, as more heat is thereby transferred from the effluent gases to the coke. The depth of the bed of fuel was found to vary in different plants from 4½ to 10 feet; but too deep a bed offers too great a resistance to the blast, and so diminishes its efficiency.

The registering indicator of the make already referred to shows so clearly the course of the production of gas, that it renders unnecessary any records of the lengths of the "blows" and "runs" and the gas made per charge of fuel. But it is useful, for the sake of completeness, to have also a continuous record of the proportion of carbonic acid in the water gas made. This can be secured by means of the "Autolysator" devised by the author and colleagues.* The proportion of carbonic acid increases when the decomposition of the steam is not good, and *vice versâ*. In ordinary working, a proportion of 20 per cent. of carbonic acid in the water gas is sometimes found at the end of the "runs," notwithstanding that the directions as to the duration of the "blows" and "runs" have been carefully adhered to. When the registering indicator with the signal-bell is adopted, the proportion of carbonic acid becomes much smaller on the average, and tolerably uniform. This apparatus has been adopted in connection with the water-gas plants at Königsberg, Posen, Elberfeld, Pforzheim, Itzehoe, Dortmund, Plauen, Pettau, Heidelberg, the Tegel works at Berlin, and by Messrs. Thyssen and Co., Mülheim-on-the-Ruhr; and it is being introduced at the Danzigstrasse Gas-Works in Berlin, at Budapest, at Chemnitz, and elsewhere. Among these installations are included plants according to the Dellwik, the Humphreys and Glasgow, the European Water Gas Company, and the Strache systems; and in the appended table the effect of the introduction of the Strache indicator on several of these plants is shown. All four systems are included in the table; but to avoid invidious comparisons, they are distinguished merely by numbers. The table shows in many cases the actual reduction in the mean proportion of carbonic acid in the water gas due to the working being carried out according to the warnings of the registering indicator. The increase in the make and the reduction in the consumption of fuel and of steam are likewise shown. The observations from the results of which the table is compiled were made by Herr Breisig.

* See "JOURNAL," Vol. XCIX., p. 832.

Buying Coal on the Basis of Analytical Results.

Herr O. Mohr has recently advocated in the "Oesterreichische Chemiker Zeitung" the sale and purchase of coal on the basis of analytical results. From a summary of his article in the "Zeitschrift des Vereines der Gas-und Wasserfachmänner in Oesterreich-Ungarn," it appears that, while he recognizes the difficulties attending the proper sampling of large deliveries of coal, he quite believes that they are by no means insuperable, and that the purchaser would benefit if he were able to buy on the basis of the calorimetric value of a fair sample of the coal. He would determine the calorific value by means of a calorimeter, and the proportions of ash and moisture in the coal. Contracts should guarantee either a minimum calorific value or the price should be fixed per million units of heat instead of per ton. Further, the price should diminish according to an agreed scale when the proportion of ash in the coal rises, as when the ash exceeds certain limits the coal can only be used with difficulty for certain purposes. He would also like to see agreement as to a standard method for determining the fusibility of ash. The determination of moisture and of volatile matter and coke are of importance in fixing the origin of the coal, and in judging its behaviour on the grate. Herr Mohr states, in conclusion, that the calorific value of coal is already commonly taken as the basis of coal sales in England; and he considers that German coal factors must also accept the same basis if they are to meet English competition.

The Institution of Municipal Engineers.—At a meeting of the Executive Committee of this Institution on the 17th ult., many further applications for membership were considered; the membership roll now standing at 320. Draft bye-laws were submitted by a Committee appointed for their preparation, and approved subject to confirmation at the general meeting of members to be held next Friday. It was decided that, recognizing the great possibilities of an Institution of Municipal Engineers in the widest sense of the term, men holding important appointments under local authorities as electrical, gas, mechanical, and water engineers should be eligible for election to membership of the Institution. Particulars of the aims and objects of the Institution, together with forms of application for membership, may be obtained of Mr. B. Wyand, the Secretary, No. 10, Eagle Place, Piccadilly, London, W.

MANCHESTER DISTRICT JUNIOR ASSOCIATION.

As an experiment, the Council of the Manchester and District Junior Gas Association decided to hold their October meeting at Liverpool, and, in response to the request made by several members, looked about for a subject which would be of interest to young gas engineers—particularly those who, having been trained in a large city works, are called upon in a new appointment to adapt the old buildings to modern requirements. That the Council were justified in the course adopted, was proved by the large attendance at the Central Technical School, Byrom Street, Liverpool, on Saturday afternoon, when Mr. R. E. GIBSON, Assoc.M.Inst.C.E., of the Liverpool Gas-Works, delivered an interesting address on "Notes on the Adaptation of Old Retort-Houses to Modern Methods." Mr. E. J. WELLENS, of Hebden Bridge, the President, occupied the chair.

The PRESIDENT, in opening the proceedings, expressed his gratification that so many members had turned up for the meeting. Mr. Gibson really needed no introduction to the meeting. It had been his privilege to be associated with Mr. Edward Allen, M.Inst.C.E., at the Liverpool Gas-Works; and he was well qualified to speak on the subject he had chosen.

Mr. GIBSON then proceeded to read the following paper; and by the aid of lantern slides thrown on the screen, his points were fully illustrated.

ADAPTING OLD RETORT-HOUSES TO MODERN METHODS OF CARBONIZATION.

When the author was invited to read a paper before the Association, it occurred to him that he could not do better than give some notes on the adaptation of old retort-houses to modern methods of carbonization, as it has fallen to his lot to have been engaged, under the direction of Mr. Edward Allen, M.Inst.C.E., Chief Engineer to the Liverpool United Gaslight Company, on the entire reconstruction of the carbonizing plant in no fewer than six old retort-houses, built at dates ranging between 1820 and 1883. The work comprised new retort-benches, retort ironwork, coal-breaking, handling, and storing plant, stoking machinery, electrical plant, and coke plant—in most cases rendering considerable alterations to the old buildings unavoidable.

In this country the retort-houses, in a large number of works, have already been extended as far as possible, or so arranged in conjunction with other plant as to be incapable of much alteration or extension; and it is especially to those members who may be, now or at some future time, engaged making the best of such retort-houses—many of them very old and never intended for anything but direct-fired hand-worked horizontal settings—that these remarks are offered. The young and rising generation of gas engineers have frequently to deal with works of this kind; not many being so fortunate as to be called upon to design and construct entirely new works. Many of the difficulties which confront one when reconstructing in an old house, do not present themselves where entirely new works are to be built. It is in dealing with ancient buildings and plant, and endeavouring to use them to the best advantage, having regard to economy and efficiency, that resourcefulness and ingenuity are usually called for.

In introducing this subject, the author is aware that there are great differences of opinion on many of the points that will be raised. He can only say that the ideas and methods set forth in this paper are those which his own experience has dictated; and one reason for bringing the subject forward is that it may provoke some discussion. It is not the present intention to describe at length the reconstructions recently carried out at Liverpool, but, in treating of the subject generally, to mention some of the difficulties and problems met with, and results arrived at by the experience gained.

GENERAL CONSIDERATIONS.

Let it be assumed that a retort-house is in existence containing a number of old direct-fired horizontal settings, that the retorts are at the end of their useful life and need renewing, also that an increase in the output is desired. The first questions which will present themselves in approaching the problem are these: (1) Is any part of the old carbonizing plant to be re-used? (2) What is the amount of space available in the old building for new plant? (3) By demolishing the whole or a part of the house and rebuilding it, could the site be used to better advantage, having regard to an increased output of gas, and facilities for receiving the coal by rail, carts, canal, &c.? (4) What is the greatest output that should be arranged for, bearing in mind the capacity of the existing condensing and purifying plant, which, in a great many works, do not lend themselves to easy extension? (5) What are the probable future requirements for the next ten, fifteen, or twenty years, having regard to the past rate of increase in business, and the relative proportions of winter and summer deliveries? The determination of the capacity of the plant to be erected may be conveniently deferred until some idea is formed of the type of carbonizing plant to be adopted, and its adaptability to the ground space available.

VARIOUS SYSTEMS OF CARBONIZING.

The all-important question as to what system of carbonizing should be adopted is a most perplexing one. The gas engineer

of 30 or 40 years ago had a clear and simple course before him; but now there are horizontal retorts with various kinds of stoking machinery, inclined retorts, "forty-fives," vertical retorts, chamber retorts, and coke-ovens to engage the attention of the present-day engineer. Considerations of space, capacity, reliability, description of coal available, make per ton, quality, residuals, life of settings, capital cost, cost of working and independence of skilled labour, are all matters requiring much study and deliberation. It is not in the province of this paper to attempt to set out fully the relative advantages and disadvantages of the various systems; but some observations on them so far as they affect the subject of the paper may be permitted. Let it be said then that chamber retorts and coke ovens for town gas-making purposes have as yet made little or no headway in this country.

Vertical Retorts.—Vertical retorts of the continuous-feed type have been, and are being, erected in this country; and numerous installations of the intermittent type have been erected abroad. Continuous carbonization is an ideal worth striving for; and all honour to those able men who have already achieved so large a measure of success, and who are still labouring to evolve a thoroughly satisfactory and trustworthy plant. The system undoubtedly holds great possibilities; but the author is not at present prepared to admit the superiority of vertical retorts over the best machine-worked horizontals, taking all things into consideration. In an old retort-house of narrow span, where single-ended retorts have been previously used, vertical retorts might be installed with advantage, as they require a comparatively small width of ground space, and the output from such a house could be thereby increased. On the other hand, their introduction into an existing retort-house would render the removal of the roof necessary, either wholly or in part. This will be readily seen from a study of the following figures:—

	Feet.
Height of old retort houses to eaves	20 to 35
Height required by Dessau verticals	50
,, ,, ,, Woodall-Duckham verticals .	44
,, ,, ,, Young-Glover ,, .	60

The sacrifice of an existing retort-house roof, though regrettable, is not so serious a matter as at first might be supposed, because vertical settings can, in most cases, be protected from the weather by short-span roofing of a very simple and inexpensive kind. In addition to the saving in the cost of labour—on which something further will be said—several collateral advantages of a less important character are claimed which cannot be discussed in this paper.

Inclined Retorts.—Inclined retorts of the ordinary type are now largely in use; but since the advent of stoking machines of the pusher and projector type, fewer settings have been built on this plan. They are especially suitable for narrow and lofty retort-houses, owing to the comparatively small width of bench required, and the extra height of the settings and hoppers. In considering the adoption of inclined retorts, it must be borne in mind that their first cost is often quite as much as for horizontal retorts with machinery; the cost of renewals is greater; while the labour charges are much more than those required for a well-employed machine-stoked bench. In many old retort houses the advantage in respect to ground space is of no practical value, as the width of the house is a fixed dimension and may be only sufficient for one bench of retorts. Two benches running parallel to each other would require a house of exceptional width. Two benches containing slopers 15 feet long have been placed back to back with some success in an old house 70 feet wide, formerly occupied by a horizontal bench of 20 feet retorts. The intense heat on the charging stage between the two benches, however, rendered the lot of the men almost intolerable, especially in the summer. The gain in capacity is obtained at the expense of discomfort to the men—a matter which ought not to be overlooked. This drawback may be to an extent overcome by covering the faces of the benches with a non-conductor of heat. At Stockport, there is a still narrower house containing two parallel benches—the span being only 64 feet; but the two charging stages are extended outside the walls of the building.

The absence of power-driven machinery for charging and discharging the retorts may be claimed as one of the advantages of slopers, as also for verticals. But this is a matter of minor importance when it is remembered that a large amount of power is necessary in the retort-house for driving the coal-conveying plant common to vertical, inclined, and horizontal systems; while not infrequently coke-conveyors are also employed. The clear height required by a bench of slopers—from the top of the retort-bench foundation to the top of the coal-conveyor—may be taken at anything between 42 feet and 57 feet, according to the design of the setting, the number of tiers of retorts, and the depth of the coal storage hoppers. In nearly all old retort-houses, the height is insufficient for slopers; this being one of the greatest difficulties to be contended with. In some instances the roof has been raised, and the walls built higher, to accommodate inclined benches; thus incurring heavy expenditure. Another way of surmounting the difficulty is by placing the conveyor, or, if needs be, the conveyor and the coal-hopper, above or through the roof. Examples of this may be seen at the Athol Street and Linacre works at Liverpool. This method, though troublesome, is much less costly than that of raising the roof and walls of the building. In both cases referred to, the roof principals actually pass through the sides of the hoppers. The cutting and patching of the hoppers to fit around the principals was carefully and satisfactorily done by the contractors, so that each principal is quite free to move independently of the hoppers. A light galvanized iron roof was fixed over the hoppers, the conveyor, and the gangway alongside; the framing being attached to the hopper structure and not to the old roof.

Inclined retorts at 45°, completely filled, have been worked, it is said, with very satisfactory results; and it is not impossible that they may prove to be as successful and economical as any of the other systems.

Horizontal Retorts with Machinery.—Horizontal regenerative settings worked by machinery have again come to the fore during the last seven years, owing largely to the invention of the projector machines for charging, the ram pusher for discharging, and, lastly, the Fiddes-Aldridge machine, which has the unique advantage of being able to charge and discharge at the one stroke. Wherever a sufficient number of settings of through retorts can be built or are in existence, any of these power machines may be employed with advantage. Of the various stoking machines now on the market, it may be said that the differences in first cost and in the cost of working are not very great; but, as Mr. Allen said in his paper read before the Institution of Gas Engineers: "Whatever is done with two machines, discharging the coke and charging with coal by two distinct operations, should in the same works be more inexpensively accomplished by a simultaneous discharger-charger machine." The installing of any of these modern machines in an old retort-house should not be a matter of great difficulty unless exceptional conditions are met with. At Liverpool, the Fiddes-Aldridge machines have been set to work in two old retort-houses with most satisfactory results; while three more of these machines are being installed at the present time.

Costs.—In the conversion or reconstruction of old retort-benches on modern lines, the financial prospect will be the leading factor in determining the system of carbonizing to be adopted. The question "Which will pay the best?" will ever be of paramount importance. In arriving at a proper solution of this question, the different conditions prevailing in each case in respect to the number of shifts, rate of wages, facilities for delivering coal and removing coke, the scrapping or retaining of old plant, and many other matters must be carefully studied. Unfortunately, reliable comparisons of the various systems are difficult to obtain, owing to the conditions differing widely in different places. If, however, the items be eliminated which vary according to local customs or conditions, a fairly reliable comparison can be made in regard to the actual carbonizing plant only, capable of general application. As coal breakers, elevators, conveyors, storage hoppers, and power for driving them, are alike common to vertical, inclined, and machine-charged horizontal retorts, it is unnecessary to include them in the comparison, especially as coal plant may be varied considerably in design, capacity, and cost, and therefore might, if included, vitiate a true comparison of the carbonizing plant proper. The same objection may be raised also to the inclusion of the means employed to remove and quench the coke. In comparing the capital costs, the basis of comparison should be the tonnage of coal rather than the make of gas, as the latter may be made almost anything according to the heats, the amount of steam admitted, and other circumstances; the quality of the gas being thereby affected. Taking, then, the actual carbonizing plant, including retort bench and foundations, and the machinery or apparatus employed to charge and discharge the retorts, the following figures may be given:—

TABLE I.

	Verticals.	Inclined.	Horizontals.
Number of settings . . .	7 ..	8 ..	16
,, ,, retorts . . .	84 ..	64 ..	96
Length of retorts	16 ft. ..	20 ft. ..	20 ft.
Coal carbonized per day . .	100 tons..	112 tons ..	150 tons
Actual first cost	£11,425 ..	£9500 ..	£10,490
Actual first cost per ton of coal per 24 hours . . .	£114 ..	£85 ..	£70

The figures given in this table for verticals have been taken from Mr. Körting's article on the "Dessau Verticals in Comparison with Other Systems."* The figures given for slopers and horizontal retorts refer to installations recently erected at Liverpool; the latter being worked by a Fiddes-Aldridge machine. It will be seen from the above table that horizontal retorts with stoking machinery are much cheaper in first cost than Dessau vertical retorts, and less than inclined. In order to form a tolerably accurate idea of the relative costs of working the three systems, the following items of labour—viz., attention to furnaces, pipe-cleaning, attention to the coal plant, the removal of coke, and supervision—may be eliminated, as they are common to all, and variable according to the local circumstances of each case. There remains then the labour of charging and discharging the retorts.

The figures given in Table II. are based on actual results; the number of retorts in each case being sufficient to keep the men well employed.

These figures clearly show that the cost of labour in charging and discharging horizontal retorts by the Fiddes-Aldridge machine is practically the same as for Dessau vertical retorts. If the cost of power be also taken into account, it should be remembered that in the case of vertical retorts and inclined retorts the coal has to be elevated to a much greater height than is required for machine-worked horizontals. The extra power required for this purpose may not be so much as that required to drive the stoking

* See "JOURNAL," Vol. CI., p. 93.

TABLE II.

	Verticals.	Inclined.	Horizontals.
Number of retorts	120	48	120
Amount of charge	1200 lbs.	7 cwt.	7 cwt.
Duration of charge	10 hours	4 h. 48 m.	4 h. 48 m.
Coal carbonized per 8-hour shift	51·44 tons	28 tons	70 tons.
Men employed per shift	1 Charger, 1 Discharger	1 Charger, 2 Dischargers	1 Machine-Driver, 2 Lid-men.
Tons per man-shift	25·72	9·33	23·33
Cost per ton—Labour (rate 5s. per shift)	2·33d.	6·43d.	2·57d.

machine, but will to some extent neutralize the advantage of the former in this respect.

The cost of maintenance and renewals is a matter not to be lost sight of; but to determine the amount that should be charged to each system is very difficult, owing to the great diversity of experience in different quarters. It can be said, however, that a three years experience of the Fiddes-Aldridge machine at Wavertree has shown that the cost of maintaining it is very small, amounting to less than 1d. per ton of coal carbonized during that period. If interest and depreciation be also considered, the advantage lies with the machine-worked horizontals, owing to their lower first cost. From these particulars it may be gathered, from a financial point of view—neglecting for the time being the advantages claimed for verticals in improved values of residuals—that machine-worked horizontal retorts are lower in first cost and as economical in working as verticals, and may be used in most old retort-houses with great advantage, more especially where the number of the retorts permits of the machine being kept well employed.

The question naturally arises as to how far it would be profitable to adopt stoking machinery for horizontal retorts in small works, where the machine could not possibly be kept fully employed throughout the year. Let it be assumed that the retort-house is about 90 feet long, with an existing regenerative retort-bench, containing nine beds of six retorts 20 feet long, previously worked by hand labour, similar to those at the Wavertree works, Liverpool. The cost of erecting the coal-handling plant, the continuous hoppers, the Fiddes-Aldridge machine, the steel rails, and the whole of the electrical equipment, would amount to about £3500. The bench would be capable of carbonizing 34,500 tons of coal per annum. But for the present purpose, let it be supposed that only five beds out of the nine are being worked, carbonizing at the rate of 19,000 tons of coal per annum. The working expenses per ton of coal from coal waggon to coke heap at Wavertree amount to 1s. 6d. when in full work, and would come to 1s. 9d. when only half the house is being dealt with, including the cost of power and ordinary wear and tear. Taking the latter figure, and the cost of hand work as 2s. 7½d. per ton, there is a gain of 10½d. for every ton of coal carbonized, representing an annual saving of £831, which would wipe out the cost of the extra plant and interest in less than five years. With any larger installation, or one more fully employed, the saving would be greater. In a bench containing 120 retorts worked by one machine, for instance, the working cost per ton would be 1s. 3·22d. on 76,000 tons of coal per annum, representing an annual saving of £5155, or sufficient to wipe out the first cost almost in one year.

GENERAL ARRANGEMENT OF BENCHES.

The number of retorts to be erected in each setting, the width of the main arches, the main dimensions of the bench, and the determination of its position in the house, are matters which must be primarily considered in planning reconstructions. The benches recently reconstructed at Liverpool consist of two inclined benches at the Athol Street works and one at the Linacre works, and six horizontal benches at the Wavertree, Eccles Street, and Linacre works. Prior to 1900, the two retort-houses at Athol Street, built nearly sixty years ago, contained a number of hand-worked direct-fired settings. At that time Mr. William King, then Engineer to the Company, turned his attention to the inclined system, and erected two benches in the south house; each bench being entirely independent of the other. In 1903, the old direct-fired settings in the north retort-house had reached the end of their useful life, and Mr. King again decided to erect inclined benches with regenerator furnaces; the settings in the other house having turned out satisfactorily, and reduced the manufacturing charges to about one-half of what they had been previously.

The north house was 173 ft. long, 55 ft. 9 in. wide, and 38 ft. high from the ground floor to the eaves. A substantially built chimney occupied the centre of the building, and on each side of it was a retort-bench containing ten beds of seven retorts, each 18 feet long; the total capacity of the house being 1,372,000 cubic feet per day. The house was of the stage-floor type, and the old direct-fired settings did not extend below the stage floor—being built upon a substantial foundation of brick piers and arches rising 10 feet above the ground. The retort-fittings throughout were old-fashioned and in bad repair, as was also the floor, consisting of joists and cast-iron ribbed plates. The stage floor construction was favourable to the installing of slopers, owing to the great depth available. In deciding upon the number of beds and of retorts per bed, previous experience in the other house was turned to good account. Settings of eights in three horizontal rows, and settings of sixes in two vertical rows, had been at work previously; but the sixes were the more satisfactory as regards even and regular heats; the larger combustion chamber, and the absence of retorts immediately over it, was found to be a better arrangement in every way. In the new benches it was decided to combine the advantage of eights with regard to capacity with that of sixes in respect to construction, and erect six settings of eight retorts, 20 feet long in each bench—the retorts being in two vertical rows. The first bench was completed before the second one was commenced. The producing capacity of the house was only slightly increased by the reconstruction, as it was not deemed advisable to attempt to overwork the other parts of the plant, which were none too large for the work they had to do.

In 1905, it became necessary to renew the settings in the No. 1 retort-house at Linacre. This house was of more recent date, having been built in 1881. Its length was 219 feet; width, 70 feet; and height to the underside of the main roof tie, 36 feet. It was a gable-ended building, with a coal-store running each side, and no cellar. Such a spacious building as this presented few difficulties; and an installation of inclined retorts, similar to those at Athol Street, was decided upon. The original benches built in 1882 consisted of twenty beds of sixes, 20 feet long, direct-fired; the retorts being bottle-necked and unsuitable for machine work. If a great increase in output had been desired, it would have been possible to have erected two lines of settings (of smaller width) parallel to each other; but the limited capacity of the existing purifying plant, and the fact that the works had been fully laid out leaving no room for extension, except for carburetted water-gas plant, rendered a large increase undesirable. Under these circumstances, a single line of inclined retorts, 20 feet long was arranged. Even this increased the output by about 40 per cent., and very ample room was left each side; so that the stages were cool and well ventilated. Eight beds of eights were installed in one half of the house only; the other being left for a future occasion. It is a fact significant of the unsettled state of affairs in regard to carbonizing methods, that the last half of this house remains still undealt with.

CHIMNEYS.

In order to obtain a convenient range of settings, it became necessary to remove an old chimney, situated 52 feet from the end of the house. This was quickly done piecemeal by the Company's own workmen. At the centre of the house a new chimney, 69 feet high, rising 12 ft. 6 in. above the ridge of the ventilator of the roof, was built on a substantial brick foundation. The new chimney, which was intended eventually to take the waste gases from two benches, was of special and light construction, 7 ft. 6 in. by 5 ft. inside, having a 9-inch outer casing of common brickwork built within a light lattice steel frame. Some projecting string-courses were carried around the top of the chimney to give it a neat finish. The inside was lined with 4½ inches of fire-brick, leaving an air-space of 2½ inches between the inner and outer casings. The lining was kept in position by projecting bricks at intervals, but was free to expand upwards, as it was not tied in any way to the outer casing. A chimney constructed in this way is very much less in cost than one of the old type. It is, moreover, easy to repair, or even pull down and refix. The steel framing is useful for carrying scaffolding or tackle, and no special men or chimney jacks need be employed. For the heating of modern retort-benches, large and lofty chimneys are now considered by most engineers to be unnecessary; and the saving in construction which can be effected on this item by adopting a light braced chimney is considerable.

WAVERTREE RETORT-HOUSES.

The three retort-houses at Wavertree run parallel to each other, and are of the same size—viz., 88 ft. 3 in. long, 53 ft. 10 in. wide, and 27 ft. 10 in. high to the underside of the roof-tie. Each house was formerly furnished with ten settings of direct-fired retorts, 18 feet long, of small section, some of the retorts being bottle-necked. An underground flue of very ample area connected the three benches to a large chimney at the south end of the block. As opportunity occurred, these benches have been entirely reconstructed in settings of six Ω-shaped retorts to each, with regenerator furnaces. The north house was dealt with in this way in 1895, when ten beds of six 22 in. by 14 in. Ω-shaped retorts, 18 feet long, were erected, with two producers to each setting. At that time the application of stoking machinery was apparently not contemplated, probably on account of the shortness of the house and the unsuitability of the building for any of the stoking machinery then in vogue. This reconstruction involved the excavation of the whole area of the house to a depth of from 8 to 10 feet for the regenerator furnaces and the cellars, underpinning the walls of the house, and sinking the main flue to a greater depth to allow it to pass under the new bench.

In 1904, the south retort-house was dealt with in a similar way, when nine beds of six 22-inch by 16-inch retorts, 19 feet long, were built; the settings being wider than those in the north house. In view of the development at that time of stoking machinery of the projector type, provision was wisely made for carrying the overhead hoppers and run-way for a machine stoker, if required at a later date, by extending the buckstays to a sufficient height. In 1905, Mr. Allen decided to make a trial of the Fiddes-Aldridge simultaneous discharger-charger in this house, which for more than half-a-century had been worked by hand labour only. The machine, and the encouraging results obtained, were fully and ably described by Mr. Allen in his paper already referred to, so no further mention need be made of them here.

The middle retort-house was the last of the three at Wavertree to be reconstructed; and this has been carried out during the last six months, embodying many improvements suggested by experience with the earlier installations. In this case, the more complete knowledge of the requirements of the machinery was used to good purpose in designing the installation. In order that the new retorts might be 20 feet in length and yet leave room enough on one side for a Fiddes-Aldridge machine, it was necessary to place the bench out of centre with the building. The charging floor was thus 19 feet wide from wall to bench; leaving ample room for the machine and a passage between it and the wall. The discharging floor was made only 14 ft. 10 in. wide; but this is ample for dealing with the coke pushed from the retorts. The regenerator portion of the settings was built out into the cellar 2 ft. 6 in., for the purpose of providing a free and unobstructed passage for the coke into the producer from the charging doors in front of the bench. The cellar was thus reduced in width to 12 ft. 4 in. from wall to bench. The producers were placed on the discharging side only—one to each setting, so that the hot coke, as it is pushed out of the retort, may be at once directed into the furnace.

Section of Retort.—On this bench a new departure was made in regard to the section of the retorts. The ordinary Ω-shaped retort, 22 in. by 16 in., had been previously adopted as a standard, but was evidently not the most suitable section for the straight sided "chain" of the Fiddes-Aldridge machine. It was obvious that a retort with deeper sides would accommodate a wider "chain," thus enabling a larger amount of coal to be put in. After a careful study of various sections, one was at last fixed upon as being the most suitable. The new section was the same in depth, but 1 inch greater in width; and the crown, instead of being semi-circular, was struck to a radius of 16½ inches. Fig. 3 shows clearly the old and new sections on one diagram, and approximately the increase in capacity expected, amounting to about 25 per cent.

The alterations in the three houses at Wavertree have brought about an increase in total production of 40 per cent., as well as a considerable reduction in labour and manufacturing charges. The comparatively short length of the houses at Wavertree precluded working the Fiddes-Aldridge machine to the best advantage; but at the Eccles Street works better results were looked for, as a much longer house was available.

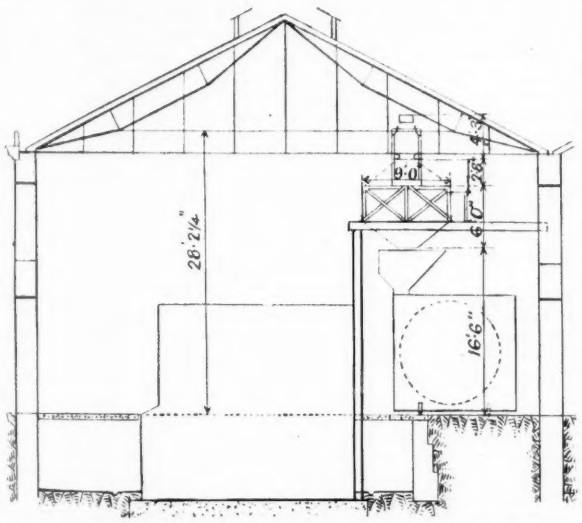


Fig. 1.—Section of Retort-House at Eccles Street—Showing Bench, Cellars, Hopper, &c.

Eccles Street Retort-House.

This retort-house was one of the oldest possessed by the Liverpool Company, having been built about 1820. The length of the house was 176 ft. 6 in.; the width, 51 ft. 8 in.; and the height from floor to main roof-tie, 28 ft. 2 in. A square chimney occupied the centre; and eighteen old beds of six horizontal retorts, each 18 ft. 2 in. long, with direct-fired furnaces, extended the full length of the house. By entirely removing the old settings and iron-work, and erecting sixteen beds of six horizontal retorts, 22 in. by 16 in. by 20 ft., with regenerator furnaces, coal plant, and stoking machinery, a great economy in working has been effected; while the productive capacity has been increased by 300,000 cubic feet per day. Fig. 1 shows a section of the house under the new arrangement. There was ample room each side of the chimney for eight settings of sixes at 8 ft. 11 in. centres, as well as for an inspection table at one end; but the width of the house was 2 ft. 2 in. less than that at Wavertree, leaving only 12 ft. 8 in. for the width of the discharging floor and 10 ft. 8 in. for the width of the cellar. It is interesting to note that during two years' working there has been no difficulty in dealing with the coke or in clinkering the fires.

Linacre No. 2 Retort-House.

The last retort-house dealt with, and which will not be completed until next year, is the No. 2 house at the Linacre (south) works—a large cellared house of more recent date than those previously referred to. It was realized by Mr. Allen that this house, with its great length of 316 feet, presented an opportunity for reaping to the full the advantages of the Fiddes-Aldridge machine. The four old benches, containing in all 186 retorts, 20 feet long, had been worked for many years by the Arrol-Foulis hydraulic stoking machinery; the four charging machines being fed with coal from a central hopper. This machinery, though excellent in its way, entailed heavy expenditure on repairs. Moreover, the large coal-hopper and elevators at the centre of the house were in an inconvenient position for receiving coal from the canal, situated near one end of the house. The existing settings and fittings also were out of date and not capable of being worked economically. In the new arrangement, the coal is discharged from the barges by means of a crane and grab, automatically weighed, broken, and elevated at one end of the house. It is then conveyed to a line of continuous hoppers for feeding the Fiddes-Aldridge machine.

The benches will, when completed, consist of 29 beds of sixes, the retorts being of the new section. In this case, the alterations will not increase the capacity of the house very much. The benches here have been kept exactly in the centre of the house, as there is abundance of room on both sides for all requirements. The existing floors over the cellars have been used again with but little alteration. The old rails have been relaid for the two new machines to run on. Opposite one of the chimneys a turn-table has been fixed; so that the machines may be turned at right angles and run into the adjoining coal-stores. By this means when one machine only is worked the other may be moved out of the way.

Cellars, Etc.

The forming of cellars in old retort-houses is a process which requires great care, involving excavations within the walls of the house, underpinning of walls, drainage, and the construction of floors. In executing work of this kind, there may be danger of disturbing the foundations, especially where the subsoil is loose and unsatisfactory. In three of the Liverpool houses already referred to, this work was done without any mishap, owing to the care exercised, but in a great measure due to the excellent subsoil, mostly good solid clay, met with. On proceeding to excavate at Eccles Street, it was found that the foundations of the old benches extended to a great depth, and were of bricks laid in hydraulic mortar. The labour of removing this material was exceedingly heavy, as it was very much like solid rock, having to be broken asunder by steel wedges and sledge hammers. When the footings of the walls of the house were exposed, they were found to extend below ground a distance of only 5 ft. 6 in. or 2 ft. 9 in. short of the depth of the new cellar. In order to avoid, as far as possible, underpinning the walls, the south wall, which formed the side of the cellar in front of the clinkering doors, was exposed to within a few inches of the bottom of the footings. Immediately below this the clay on which the footings rested, and a bank of it, sloping away from the footings and projecting into the cellar about 2 feet, was left intact and afterwards faced with concrete. As the material in the bank and beneath the footings was good clay, there was no fear of movement, nor has there been any cause to regret the policy adopted, which resulted in a saving in construction. On the north side, again, underpinning was rendered unnecessary by the building of a retaining wall at a distance of 6 feet from the bench. (See fig. 1). There being no producers on this side of the bench, a passage 6 feet wide was sufficient to give access to the flues and dampers.

Further advantages of this construction were that a solid foundation was thus obtained for the rails of the machine stoker (one rail actually running along the top of the retaining wall), a saving in excavation, and in the strong flooring which would otherwise have been required had the cellar been made the full available width. It should be stated, however, that the temperature in this narrow cellar was found to be high. An attempt has been made, with a measure of success, to reduce the heat by means of a covering of non-conducting composition fixed in the cellar to the front of the bench. As no one is required to stay in the cellar for any great length of time, the matter is comparatively unimportant. The portions of the two end walls of the building which were exposed by the excavations were carefully underpinned by brickwork in cement—only a small portion being done at a time. The earth was removed from beneath the foundations for a width of about 3 feet, care being taken not to remove more than was absolutely necessary from the back or outside of the wall. The brickwork was then built in its place—the space at the back being solidly filled as the wall went up, after which another portion was removed and built up, and so on. The old footings projecting inside the building were cut off and new footings built at the foot of the new wall.

Drainage.

The drainage of new cellars formed in old retort-houses is sometimes a difficult matter where the existing drains or sewers outside the building are of insufficient depth. At Eccles Street, the invert of the main yard sewer, which ran parallel to one end of the building, was only a few inches below the level of the cellar floor—leaving practically no depth for a fall from the other end of the retort-house, which was essential to proper working. The difficulty was overcome by making a connection with the main sewer at an inspection chamber near to the boundary of the works, about 18 yards distant from the corner of the retort-house.

At this point the sewer was at a lower level. The laying of the drain necessitated cutting a very deep trench, and careful laying of the pipes to the required fall. An open channel was formed in the concrete floor of the cellar the full length of the bench, gradually increasing in depth, with a uniform fall of about an inch in six yards. From the end of the bench to the boundary of the works a further fall of $10\frac{5}{8}$ inches was obtained in a total length of 45 yards. The fall, though inadequate, was the best that could be done under the circumstances. Fears were entertained that this drain would cause trouble, but none has presented itself after a period of over twelve months' working.

Old Materials.

The demolition of old retort-benches provides a large quantity of excellent material for making concrete for foundations. The cost of breaking is a trifling matter where a machine breaker is available. At Liverpool, a good, deep foundation for the new benches has in all cases been provided, as spareness in this matter is believed to be false economy. The stability of the bench is of the utmost importance. In pulling down old settings many of the bricks and tiles may be preserved unbroken for further use, and will repay the labour expended on cleaning them up.

Flooring.

Whether the retort-house be of the cellar or the stage-floor type, strong and durable floors are necessary to withstand the shocks, the continuous wear, the varying temperatures incidental to the process of carbonization, and sometimes the wet and grit of coke quenching. At Liverpool various systems of floor construction have been tried. For the discharging floors of inclined-retort benches and both floors of horizontal benches, a reinforced granolithic concrete floor shown in fig. 2 has been used with

FLOOR WITH EXPANDED METAL REINFORCEMENT

FLOOR WITH WELLS' REINFORCEMENT

Fig. 2.—Sections of Reinforced Concrete Floors.

great success in nearly all the recent reconstructions. A framework of rolled steel joists about 5 feet apart, is fixed, of strength suitable for the loads they have to carry. Wood centering is then erected to form the lower surface of the concrete. The reinforcement consists of sheets of expanded metal placed about an inch above the bottom of the concrete. Strips of the same material are also placed about an inch above the tops of the rolled joists. The floor is made 6 inches deep over all—the top surface being 3 inches above the top of the steel joists; and it is formed in two portions. The lower portion, $4\frac{1}{2}$ inches thick, is composed of coarse granite chippings and Portland cement in the proportions of 4 to 1, and the upper portion, $1\frac{1}{2}$ inches thick, is made of fine granite chippings and cement in equal proportions. The surface, while still in a damp state, is indented with a coarse toothed roller. During the last four years, no fewer than nine retort-house floors at Liverpool have been constructed in this way; and they have turned out satisfactorily. In some instances they have cracked, due to the expansion of the bench; otherwise they have never shown any sign of failure. They are, moreover, strong, light, and cheap.

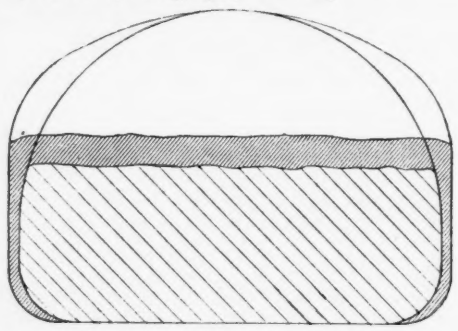


Fig. 3.—Diagram Showing Old and New Sections of Retorts.

When the Fiddes-Aldridge machine was first installed at Wavertree, the existing floor on which the rails for carrying it were laid was one of this kind. Additional supports were placed beneath the floor to carry the greatly increased load due to the machine. With these additions, the floor has stood well, and is still in very good condition. For the floors of the middle house at Wavertree another system of reinforcement has been adopted, known as "Well's," also shown in section in fig. 2. In this system, a number of steel rods are buried within the concrete as shown. The bottom rods run across the steel joists, and those laid on the top of, and at right angles to, the bottom rods are $\frac{1}{4}$ inch diameter spaced 12 inches apart. Over the top of each joist, $\frac{3}{4}$ inch below the surface of the floor, short rods, $\frac{1}{4}$ inch diameter, 2 ft. 9 in. long, are placed at 6 inches pitch, having their ends bent, split, or flattened—thus binding together the spans, and giving them strength as cantilevers, in addition to their strength as short spans from one joist to another. To form a key for the concrete covering the underside of the joists, pieces of $\frac{1}{8}$ inch diameter rod are bent around, as shown, 12 inches apart. As this floor has not been put to full use yet, nothing can be said now as to its behaviour under working conditions. The existing floor at Linacre, which is being used again for the new machines to work on, consists of steel joists spaced 3 ft. 4 in. apart, and $4\frac{1}{2}$ inch brick arches with the spandrils filled with concrete and flagged on the top surface. It is a good, reliable, and durable floor, but more costly than the ferro-concrete construction previously described.

Ventilation.

When cellars are formed in old retort-houses, arranging for proper ventilation is sometimes a very difficult matter. The high temperature of the narrow cellars at Eccles Street led to special attention being given to the subject of ventilation when designing the cellars for the middle house at Wavertree. At each end of the cellar, openings as large as possible were formed in the floor and guarded by handrails. Near the middle of the cellar a passage was formed leading into the adjoining cellar of the south house, which will very much improve the ventilation, as the latter is provided with perforated gratings along the full length of the house. Some old discarded ascension pipes were also made use of to connect the two cellars at intervals. In addition to this, 18 ventilating boxes 18 in. by 6 in. have been fixed through the floor immediately under the bottom mouthpieces, which will allow a free passage for the hot air. By these means, it is hoped that the cellars will be kept comparatively cool. In the Linacre No. 1 house, where the width is 70 feet, the charging and discharging floors were only extended to a width of 21 feet and 17 feet respectively. Wide air-spaces were thus left between the stages and the wall, rendering the house, and particularly the cellars, cool and well ventilated.

Roofs.

In using old retort-houses for modern carbonizing systems, it frequently happens that the roof is in the way, or at any rate has to be reckoned with in designing the plant, on account of the greater heights usually required. The difficulties are increased where the roofs are hipped at the ends, as were those at Athol Street, Wavertree, and Eccles Street. At the latter works, the existing roof was only 28 ft. 1 in. from the ground to the underside of the main ties, while the plant to be erected required a clear height of 37 ft. 6 in., exclusive of foundations. The greater part of the extra height was provided for by the formation of a cellar, and the remainder was obtained by running the return chain of the coal conveyor through the roof-trusses. The rafters and tie rods at the hipped ends had in some cases to be altered, the conveyor passing through the roof at one end.

Whenever new plant requires to be fixed in an old roof, the greatest care should be exercised in designing the plant. The position of the roof principals on plan should be plotted on paper, and care taken that the centres of the buckstays throughout, or the structural work above them, is quite clear of the roof principals. Such details if not carefully watched in the earlier stages may lead to much trouble and expense afterwards. At Athol Street, where the storage hoppers pass through the roof, an attempt was at first made to retain the hipped ends by leaving the last two beds without hoppers. This arrangement was found to be inconvenient, and it was also desirable that the elevator should be fixed through the roof near the end of the house. These circumstances led to the hipped portions being removed, and the roof continued to gable ends. The end walls were built up and panelled to be in harmony with the other parts of the building.

If in carrying out alterations within old buildings cast-iron principals are met with, they should be treated with the greatest care. The author has lively recollections of an old roof constructed largely of cast iron, which, without warning, completely collapsed from one end to the other in a strong gale. Fortunately, no one was beneath it at the time. Some of the retort-house roofs at Liverpool are constructed partly of this material; but great care was exercised in dealing with them, and no mishap has occurred. Owing to its brittle nature, the possibility of hidden flaws, and its low tensile strength, cast-iron is an unsuitable material for roof construction; and fortunately it is rarely used now, as rolled steel bars, much lighter, more reliable, and of much greater tensile strength, are available in a great variety of sections.

Hoppers and Conveyors.

In all modern methods of carbonizing, overhead hoppers, either central or continuous, are indispensable if the best results are to be obtained. Central hoppers have the advantage of being less in first cost than continuous ones, and have been largely used with the West and Arrol-Foulis stoking machinery. Continuous hoppers, although somewhat more costly, are much more convenient, as the stoking machine has not to return to one point every time more coal is needed, but can take its supply at any point in the length of the hoppers. Thus it is unnecessary for the machine to carry more than one charge of coal at a time. Continuous

Fig. 4.—Continuous Hoppers (Showing the Automatic Doors) in No. 2 Retort-House at the Linacre Gas-Works.

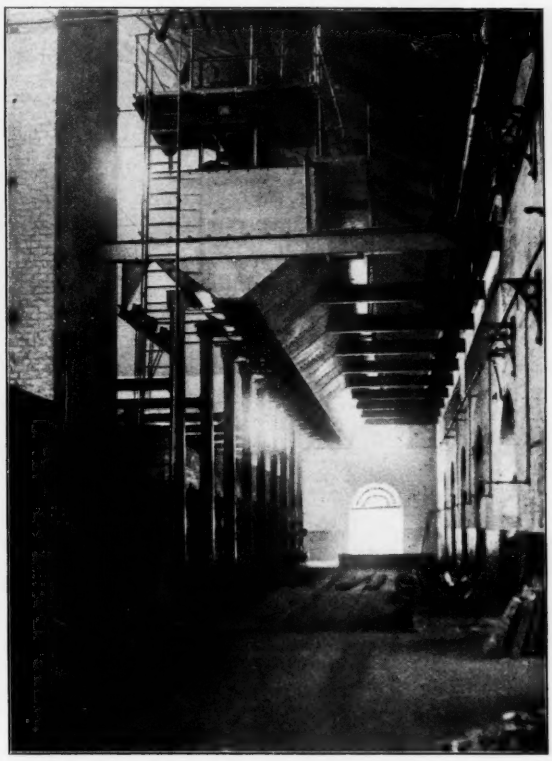


Fig. 5.—Continuous Hoppers and Driving End of Conveyor at the Eccles Street Gas-Works.

hoppers vary very much in design, especially in the lower portion. Generally the bottoms of the hoppers are divided up in the form of a number of inverted truncated pyramids, each one fitted with sliding doors worked by hand levers or chain wheels and screws. The hoppers of the inclined benches at Athol Street and Linacre were made in this way. For the horizontal benches, the hopper bottoms are continuous, and have been fitted with automatic closing doors. The continuous hopper bottom is simpler and cheaper in construction, and will hold more coal than a divided one. The patent automatic doors have now been working satisfactorily for over two years, enabling the stoking machines to take a measured quantity of coal required for each charge as it travels from one retort to the next without any special attention on the part of the driver or loss of time.

This device was tried at Wavertree works in connection with the first installation of the Fiddes-Aldridge machine. After many experiments success was achieved, and the doors have been fixed in all the subsequent installations. In designing hoppers for old retort-houses, their capacity is often limited, owing to the insufficient height of the roof. Where possible, a capacity equal to a full day's requirements should be arranged for; and it is an advantage to have even more than this where the height will permit. Should a breakdown in the coal-handling plant occur, a well-filled hopper is a great convenience, enabling repairs to be carried out without interruption of carbonizing. A sufficiently large hopper will also do away with the necessity of working the coal plant on Sundays. In two instances at Liverpool—previously referred to—the hoppers were carried through the roof, in order that ample capacity might be obtained. At Linacre in two houses the hoppers have been designed to hold fully two days supply, and this has proved to be of great value. Figs. 4 and 5 show the continuous coal-hoppers at Linacre and Eccles Street respectively.

For feeding a continuous hopper the conveyor must be capable of delivering coal at any point in its length. At Liverpool, the conveyor used throughout for this purpose is of the trough and push-plate type. The great advantage this type possesses over others is in the small amount of attention it requires. For instance, let it be supposed the hoppers are empty from one end to the other. If the conveyor is then set to work with all the slides open, it will gradually fill the hoppers up, commencing at one end, and carrying the coal over the full ones to the empty ones beyond, without any attention. Fig. 6 shows the push-plate conveyor at the No. 2 house, Linacre. It will be observed that each push-plate is provided with an axle and a pair of wheels, which effect smooth and silent running, greatly reduce the friction, and therefore the amount of power required to drive the conveyor. At Eccles Street and Wavertree the return chain of the conveyor passes through the roof principals—a very convenient arrangement where height is limited. Belt conveyors are sometimes employed for feeding continuous hoppers; but where one is used, a throwing-off carriage is necessary. This must be moved along from place to place as the hopper fills up. The throwing-off carriage requires a considerable amount of height, which in most old retort-houses is not available. Other types, as, for instance, the gravity bucket conveyor, may be used; but the experience at Liverpool goes to show that for reliability, efficiency, and the small amount of attention and power required, the push-plate conveyor of good design takes some beating where broken coal is being conveyed. Long conveyors of this kind, should always be driven at the delivery end, and not at the receiving end; so that the delivering side only is in severe tension, the return side being slack. When the drive is at the receiving end, the whole of the conveyor chain is subject to the load, and must be kept tight, putting an undue stress on the chain, and requiring more power to drive. In order that full advantage may be taken of the angle of repose of coal in stocking, care should be taken to place the trough of the conveyor sufficiently high for this purpose. This point has been frequently lost sight of in designing coal-storing plant, with a consequent loss in capacity of the hoppers. Figs. 5 and 6 show how the conveyors have been arranged at Liverpool, so that the hoppers may take the greatest capacity possible.

Breakers and Elevators.

The introduction of modern plant to old retort-houses involves the erection of breaker and elevator. Their positions should be carefully arranged with special regard to the facilities for dealing with the incoming coal. At three of the Liverpool works, coal is delivered by canal; and previous to 1904 the whole of the coal-barges were unloaded by men with barrows. At the present time nearly all this canal-borne coal is handled by mechanical means, and is never touched by manual labour from the time it leaves the pit. In each case the coal is transferred from the canal barge to a receiving hopper by a fixed or travelling and revolving steam crane and grab. The coal thus passes by gravity into an automatic weighing machine, and from thence to the breaker, after which it falls into the boot of an elevator, where it is carried up into the roof of the retort-house and placed upon the conveyor. The position of the breaker and elevator in each case must be a convenient one for receiving the coal from the grab where this method of handling is adopted. At Athol Street the end of the retort-house adjoins the towing path of the canal. It was therefore necessary to fix the elevator at right angles to the direction of the bench, and the breaker in the coal-store on the south side of the house. The crane was fixed exactly half-way between the two retort-houses, so that it is available for feeding either or both houses. Owing to the very long reach required by this arrangement, the elevators were much greater in length, and inclined more to the horizontal than would have been the case had an entirely new house been built. Circumstances alter cases; and it is impossible to lay down any definite rules for arranging such plant. Nearly every different site requires different treatment, according to the special features of each case.

At Athol Street, contrary to the general practice, the boot of the elevator stands 9 feet above the yard level. In this case, the elevators were kept up, firstly, because the surface of the canal is

Fig. 6.—Push-Plate Conveyor over the Hoppers in No. 2 Retort-House at the Linacre Gas-Works.

about 9 feet above the yard level, and, secondly, because headroom was required beneath the elevators on the discharging stage. It may be stated, however, that the boot of the elevator is sufficiently low to admit of being fed by means of hand barrows if the supply by crane were stopped through any cause. Duplicate elevators are provided; so that if at any time one should break down the other would be available. This provision is found to be almost unnecessary, as a breakdown of an elevator of good design is a rare occurrence. When it does happen, such repairs as are usually required can be done quickly, provided that a complete set of spare parts be kept at hand. Out of five sets of elevators recently erected at Liverpool, only two have been made in duplicate; the other three being single. Experience has shown that with a single elevator the risk of a serious stoppage is small, while in the case of the duplicate sets, one of the two is idle all the time. Where one elevator only is available, it should be capable of raising a full day's supply in not more than eight hours; so that 16 out of the 24 hours are available for overhauling or repairs when required.

At Linacre, for the inclined bench in No. 1 house, the coal plant was similar in most respects to that at Athol Street, but one or two important differences may be noted. The site was a more suitable one, as a convenient plot of ground intervened between the end of the retort-house and the canal, on which were fixed the steam crane, the weigher, breaker, elevators, gas-engine, &c. The two elevators were carried through the gable end wall of the retort-house; and it was possible to make them shorter and steeper, because the position was more favourable and the roof was gable-ended, not hipped. The existing end wall of the house was found to be in an unsatisfactory condition, being badly cracked and distorted. As an opening through the wall had to be made for the elevators, the opportunity was taken to remove the worst part of the wall—a larger portion than would otherwise have been necessary. The gap thus formed was made up by steel framework and corrugated iron sheeting. As at Athol Street it was found unnecessary to sink any of the machinery below the ground, so that every part is easily accessible for lubrication and repairs. This was fortunate, also, as the formation of an underground breaker pit would have been a troublesome matter in ground so loose and marshy.

Most of the newer forms of stoking machinery require coal of small size and as uniform as possible throughout. Where screened coal or cannel is used, a powerful breaker is necessary. The four-roll breaker fixed at Eccles Street, though it will break coal small enough, allows pieces of cannel about 3 inch by 3 inch to pass through. These larger pieces are a source of trouble in charging the retort. Additional plant is now being erected for reducing the whole of the material to a size of not more than one inch cubes, consisting of a jigging screen and bye-pass shoot for taking out the small and a secondary breaker for breaking the lumps rejected by the screen.

Power and Power Transmission.

For driving retort-house machinery, the power most natural and readily available is gas; and each of the Liverpool installations is driven by a Crossley or a National gas-engine with very satisfactory results. Experience shows that they are thoroughly reliable when proper care and attention are exercised. Where a gas-engine is used for driving coal-handling plant, as in the case of inclined installations, it is working only during the day time—sixteen out of the twenty-four hours are then available for any overhauling and repairs that may be necessary without a special stoppage of the plant. When the power is required day and night as in the case of a machine stoker, a duplicate engine is a great convenience. The gas used in each engine at Liverpool is measured by means of an "Equitable" meter. This meter has the great advantage that it only occupies one-tenth of the space required by an ordinary dry meter of the same capacity.

For the inclined benches, the power of the gas-engine is transmitted by means of pulleys and belting; but for the whole of the machinery of the horizontal benches the power of the gas-engine is transmitted by electric generators, cables, motors, &c. In each case the engine and generator are in duplicate—only one set working at a time; the other being available when any overhauling or repairs are required. This mode of distributing power is especially suitable for retort-stoking machinery. A pair of bare copper wires along the retort-house wall take up practically no room, and have none of the objections that can be raised against other forms of power transmission; while the electric motor with its accessories takes up very little room on the machine, and is capable of instant speed control. For distributing power to the various parts of a coal-handling plant, sometimes situated at great distances apart, electric transmission is a great convenience.

Importance of Spares.

For gas-engines, electrical plant, and machinery in or about retort-houses, the great importance of having ready at hand for instant use a complete set of spares as far as is practicable, cannot be too strongly emphasized. Spares of all parts, subject to wear or likely to fail, should be always kept in stock, and at once replaced by others when they have been taken for use.

The Weighing of Coal.

In all gas-works accurate weighing machines are indispensable for the weighing of the raw materials as they are received. The materials brought into the works by rail or carts are passed over platform weighing machines in the ordinary way, and formerly the coal received by canal was weighed on small platform machines—one barrow load at a time. On the introduction of the crane and grab for emptying the barges, a means of accurately and expeditiously weighing the material had to be at once sought for—capable of weighing large lumps as easily as the small. Many automatic machines had previously been used elsewhere, of the "cut-off" type, suitable for grain or small coal, but quite unsuitable for the Liverpool conditions. The "Avery" automatic weigher and totalizer was fixed at Athol Street as an experiment; being the first of its kind to be erected in this country on a working scale. After sundry alterations and improvements, it was stamped by the Government Inspector and has worked satisfactorily ever since. So successful was the experiment, that two more machines of the same pattern have recently been ordered. By this machine 15 cwt. of coal is weighed at a time. A whole barge full of coal, or a day's supply, may be weighed and registered without anyone going near the machine. A small amount of power—only about ½ H.P.—is required to drive the mechanism. Inside the retort-house it is desirable to have some means of measuring or weighing each charge of coal, in order to ensure the best results. Variable charges involve variable heats, with their attendant evils. At Liverpool, adjustable measuring chambers have been used in all cases, with very satisfactory results.

Discussion.

After an adjournment for tea at Cumberland House—a restaurant adjoining the Technical School—the members returned to discuss the paper.

Mr. Harold Davies (Blackburn) expressed doubt as to the

wisdom of the adoption of the suggestions made in regard to the number of charges and the amount of coal dealt with in the shifts, as set out in Table II.

Mr. WILLIAM HILL (Stalybridge) asked if Mr. Gibson included in his statement of the working expenses per ton of coal from coal-waggon to coke-heap at Wavertree the cost of the charge for the coke-conveyors.

Mr. GIBSON: No.

Mr. HEALD (Bolton) thought that Mr. Gibson, in dealing with the actual carbonizing plant, had fixed the prices too low when he put down £114 for the first cost per ton of coal per 24 hours for verticals, and slopers at £85, as against £70 for horizontals. He would like to know if these figures included the cost of the retort-house.

Mr. GIBSON: No.

Mr. HEALD took it that the cost put down included beds, the necessary machinery, &c., in each case. He was also of opinion that Mr. Gibson's estimate of £70 for the horizontals was low. It might be that at Liverpool they got the work done cheaply; but contractors had a nasty habit of putting a big price on this class of work. He questioned very much if they could adapt (say) the Fiddes-Aldridge machine at Wrexham to the works at Liverpool, or *vice versâ*, at the cost put down, and he would like to have more information on the point. He also doubted if the weight of coal named would pass the hopper into the machine at the same speed, and asked for Mr. Gibson's opinion on the point.

Mr. GIBSON said, with regard to the criticism of his figures, he had better explain that they represented the coal carbonized; and the plant included the retort-benches, foundations, and the machinery or apparatus employed in charging and discharging the retorts. With reference to the charges, he might say that the machines they now had in Liverpool would not put in 12 cwt. The greatest amount now dealt with was 8 cwt.; but with a new machine which had not yet arrived, they expected to put in 10 cwt. comfortably.

A MEMBER: And can it be used for (say) 7 cwt.?

Mr. GIBSON replied that the maximum of 10 cwt. could be dealt with or less—5 cwt., if they liked. He did not think there would be any great difficulty, as suggested, in dealing with the transference of plant from one works to another. As to the definite weight of coal passing from the hopper into the machine, if the speed was not excessive, no difficulty would arise in the machine-chamber being filled up completely every time. As to coke-conveyors, he was of opinion that no system would be perfect unless it transported the coke without breaking it. The 1s. 6d. included the handling of the coke by hand barrows.

Mr. GINMAN did not think that in the paper the case of the slopers had been put in a favourable light. In referring to the Athol Street works, Mr. Gibson had only dealt with eight slopers, whereas he understood there were more in operation at these works. He would also like to know something further with reference to the machinery and its repair.

Mr. GIBSON said they had 26 slopers at Athol Street; but he only took one bench of eight retorts for the purposes of his illustration. Had he taken the lot, the price would have been proportionately greater, or nearly so. As to the machinery, they found that the part which wore the most was the chain; but, as a rule, they would last a year without any repair. They kept a spare one ready for use in case of accident; and the old one could invariably be repaired and made almost as good as new at a small cost. Of course, they in Liverpool had had some trouble with the machine; but they had got over this. One had been at work since July, 1907, without breaking down. This he regarded as a very good record.

Mr. J. TAYLOR (Mosley) explained that at Hollinwood they had found that with the West coke-conveyor the amount of breeze was particularly low.

Mr. GIBSON observed that there was no doubt the introduction of machinery such as described had caused great anxiety to gas engineers. There was always the possibility of a breakdown, which cast an additional burden upon their shoulders. He was interested in what Mr. Taylor had said about the West coke-conveyor; for one of the things they had to consider was how to reduce the quantity of breeze. Though he had seen this conveyor at work, he could not say much about it.

Mr. J. ALSOP (Stockport), having given some particulars of the retort-houses and machinery in use at the Stockport Gas-Works, asked Mr. Gibson to say from his experience what "spares" they should always have at hand.

Mr. GIBSON said it was desirable in regard to "spares" to always have a good length of chain, axles, buckets, and wheels likely to fail. He did not think it was necessary to keep a spare shaft.

Mr. DAVIES was of opinion that concrete ought to have been used in putting in the foundations of the retort-houses referred to by Mr. Gibson. Had this been done, the cost would undoubtedly have been considerably raised.

Mr. GIBSON said they in Liverpool then were perhaps fortunate in having good ground to deal with for foundations. Where the soil was not good, no doubt the use of concrete would be an excellent thing; and he would bear Mr. Davies's remarks in mind.

Mr. D. V. HOLLINGWORTH (Salford) had something to say in favour of inclines. At Salford, they were found to work very well, and did not require any great attention. Eminent engineers who had visited Salford had been so impressed that they had recommended similar plant elsewhere; and duplicates of the Salford plant were to be found in Japan and other countries abroad. This he thought was good testimony in their favour. He was of opinion that verticals would come to the front, and he asked Mr. Gibson's opinion on the point.

Mr. GIBSON thought the ideal system of the future would be the continuous one; and in his opinion the Young-Glover arrangement would forge ahead. He had seen it at work at St. Helens, and believed there were great things in store for it.

The PRESIDENT supplied some particulars of the vertical retorts he had seen at work at Berlin, and said he believed they would be generally adopted. Before concluding, he moved a hearty vote of thanks to Mr. Gibson for his paper, and to those who had assisted him.

Mr. A. L. HOLTON (Manchester) seconded; and Mr. F. THORPE, in supporting, inquired if they could have photos. of the slides thrown on the screen for use in their library.

The motion having been put and carried with acclamation,

Mr. GIBSON responded. There would be no difficulty, he said, in complying with Mr. Thorpe's request. It had been a great pleasure to him to give his paper; and he was gratified that it had evoked such an interesting discussion.

DETERIORATION OF COAL.

The "Iron and Coal Trades Review" has summarized a paper on this subject communicated by Messrs. S. W. Parr and W. F. Wheeler to the American Chemical Society—giving the results of observations on a kind of deterioration of coal which cannot be described as "weathering." It appears rather to be due to the removal of the coal from the conditions under which it existed in the seam. Samples taken from the seam, without drying, were packed in gas-tight jars; and, when these were opened ten months later, a slight pressure of gas was observed, which ignited with a strong, blue flame. In another series of tests the coal was air-dried, and then placed in jars in such quantity as to occupy only about one-fourth their capacity. When the jars were opened eighteen months later, a considerable absorption of oxygen was found to have taken place—the air in the jars containing 2 per cent. of carbon dioxide and less than 1·5 per cent. of oxygen.

There is sometimes noticed a loss of calorific value between the time of mining and the delivery of coal at its destination. As the result of ten months' storage in the laboratory, losses of 1·3 to 3·4 per cent. have been recorded. This loss apparently occurs during the first two to three weeks after mining, and it is attributed to liberation of combustible gases, owing to the release of the conditions of pressure and sealing in the seam.

The deterioration of coal by "weathering" is somewhat different from the foregoing, and may be ascribed to the oxidation of certain of its constituents. Pillars of coal which had been for twenty-five years exposed in the mine showed a loss of 2·5 per cent. in heating power, as compared with freshly-exposed coal adjacent in the same seam. The loss described as due to "weathering" takes place in a dry atmosphere just as much as on exposure to the weather. The losses under this head do not appear usually to exceed 3 to 4 per cent.; while no loss occurs if the coal is kept from the atmosphere by submersion under water.

The Carlow Testimonial Fund.

We learn from Mr. Lawrence Hislop, of Uddingston, the Secretary and Treasurer of the North British Association of Gas Managers, that a Sub-Committee of the Association, consisting of Mr. J. D. Smith (Stirling), Mr. W. Blair (Helensburgh), and himself, visited the widow of the late Mr. R. S. Carlow, at Stirling, on the 23rd ult., and, in the name of the Association, presented her with a purse of sovereigns, in recognition of her husband's services as Secretary for twenty-one years. The presentation was made by Mr. Smith, as President of the Association for the year; and a reply on behalf of Mrs. Carlow was made by Mr. Adam MacPherson, of Kirkcaldy.

The Dutch Association Deputation to England.—A deputation from the Dutch Association of Gas Managers will arrive in London this (Tuesday) evening on a visit to the Franco-British Exhibition. The party will be under the leadership of Mr. George Wilson, and will stay at De Keyser's Hotel.

The Midland Junior Gas Engineering Association will hold the first general meeting of their fourth session at the Technical School, Suffolk Street, Birmingham, next Saturday. The President-Elect (Mr. James Hewett) will deliver his address; and Mr. F. J. Ward will read a paper on "Retort-House Work and Practice."

Mr. G. F. L. Foulger.—Many of our readers will, we are sure, share the regret with which we received yesterday the news that, owing to the presence of a malignant growth, Mr. G. F. L. Foulger, the Chief Distributing Engineer to the Gaslight and Coke Company, had been compelled to have one of his legs amputated. The operation was successfully performed; and we are pleased to learn that the patient is progressing as favourably as can be expected.

ANOTHER FELD PATENT.

Among the specifications issued by the Patent Office last week was one—No. 20,139 of 1907—taken out by Herr Walther Feld, of Hönningen-on-the-Rhine, for (quoting his words) "the obtainment of extraneous matters (such, for example, as tar constituents, cyanogen, ammonia, and the like) from coal gas and analagous gases in a more economical and efficient manner than hitherto."

Hitherto gas constituents, such as tar, water, and others, have been simultaneously separated from coal gas and like gases—the patentee points out—by uniformly cooling them to a low temperature, or, as described in his patent No. 26,262 of 1905* by washing such gases with the separated tar or water itself; and, in order to split the tar produced in either of these ways into its constituents, it has been distilled in vessels heated by an open fire, or by steam, and the products of distillation—such as benzol and its homologues, water, ammonia, and the various tar oils—have been separated from one another by fractional distillation.

Then the specification of the present patent proceeds: Generally speaking, tar is a mixture of more or less free carbon (soot), with hydrocarbons and other organic matters of various boiling points. As a rule, the oils obtained by tar distillation are classified according to their various boiling points as follows: Light oils having boiling points up to about 170° C., creosote oils having boiling points from about 170° C. to about 230 °C., heavy tar oils having boiling points from about 230° C. to about 270° C., and anthracene oils having boiling points from about 270° C. to about 320° C. The matters remaining in the distilling vessel, and consisting of a mixture of free carbon with hydrocarbons having boiling points above 320° C., are classified as "pitch." Vapours of such solids and liquids as can be evaporated have, at different temperatures, different tensions; the tension being the higher the nearer such product is heated to its boiling point.

According to this tension, any gas coming into contact with such matter will absorb, at a certain temperature, a corresponding amount of vapour, which amount, having a fixed relation to the temperature, is the higher the higher the temperature of the gas is. A gas in such condition is said to be saturated with the vapour of the given substance. If such saturated gas of a given temperature (B) be cooled down to a lower temperature (A), so much of the vapours must condense or separate from the gas as corresponds to the difference between the tensions of such vapours at the former temperature (B) and at the lower temperature (A). If, on the other hand, a gas in such saturated condition, at a temperature B, be heated to a higher temperature (C), without being in contact with the vaporizable substance, the gas at the temperature C will not be saturated with the vapours; and, *vice versâ*, such gas being cooled down to under the temperature C, no condensation or separation of the vapours can occur until the gas is cooled below the temperature B. This temperature B is the dew-point of the gas with reference to the given substance—that is to say, as long as the gas is not cooled to under the dew-point B, no transformation of the vapours in question into liquid or solid form, and therefore no separation, can occur.

Coal gas at the temperature at which it leaves the retorts is in this unsaturated condition as regards most of its constituents. The dew-points for different constituents are at different (gradually decreasing) temperatures, according to the amounts thereof present and their boiling points; and, according to one of the features of the present invention, the above-mentioned property of gases is utilized to effect the required separation of the desired constituents therefrom, in such a way that by taking advantage of the latent heat, and of the different dew-points of the gases themselves with regard to the different vapours contained therein, these constituents are separated from one another by a system of fractional cooling, or of fractional coolings combined with successive washings.

Herr Feld says he has found that, commonly, the dew-points of ordinary coal gas, for most of its tar constituents of high boiling points, lie near 200° C.—that is to say, so long as such gases are not cooled to, or below, 200° C., only an insignificant amount of such constituents will be condensed; and, of course, if the dew-point of such gas for water be 75° C., no water will be condensed until the gas is cooled below that temperature.

As a rule, the pipes which lead from the retorts to the condensing plant are at present arranged in such a way that the portion of the gases which comes into contact with the walls of the pipes is locally cooled, not only below the dew-point of the tar constituents, but even below the dew-point of water. Consequently, gas constituents are condensed on the walls of the pipes, while the remainder of the gases, passing through the middle of the pipes, may have a temperature far above 200° C. These hot gases coming into contact with the condensed products decompose them; free carbon being split off and hydrocarbons with less carbon—such as those of the higher series—are formed. The carbon and hydrocarbon are carried off with the gas; and this is one of the causes of free carbon (soot) in the gases, and therefore of the formation of tar, and clogging of the pipes or passages with carbon.

According to a further feature of the invention, the treatment of fractional coolings, or fractional coolings and successive washings, may be preceded by preventing, as far as possible, the above-mentioned formation of tar, in order to obtain tar constituents of higher boiling points with a low percentage of free carbon; but this invention is capable of use also in cases where constituents of lower-boiling points only are required to be separated from tar, in which case the prevention of the formation of tar as described need not be employed.

In cases where the deposit of carbon, with consequent formation of tar in the gases as they come from the retort, is to be prevented, this can be effected by maintaining the heat of the gases above, or preventing their cooling to, the dew-point of the gases for their constituents of high boiling points. This may be done in various ways—for example, by covering the pipes which lead from the retorts to the first vessel or washer (used in the process of separation by fractional coolings, or fractional coolings and successive washings) with a non-conductor or bad conductor of heat, or by applying heat to the exterior of the pipes or passages, or by gradually increasing the sectional area of the pipes or passages according to the number of retorts in communication therewith; or, again, by introducing suitable diluting gases, steam, or other vapour (superheated or not) into the retorts, or the passage therefrom, with the object of increasing the volume of the gases containing the tar constituents, or by two or more such means used in combination.

The gases passing from the pipes or passages can be conducted, for treatment according to this invention, into vessels adapted to effect the fractional coolings (or fractional coolings and successive washings) at successively lower temperatures, so that various gas constituents are separated from each other by employing the temperature of the gases themselves, without employing the "hitherto commonly practised plan" of extraneous heat for the distillation and separation of the constituents from each other after previous uniform cooling with simultaneous separation.

The treatment can be applied to the recovery of any or all of the constituents to be recovered from the gases—for instance, it can be applied (in cases where the formation of tar as above explained has been prevented), in two or more vessels for the recovery of tar constituents of the higher boiling points at successively lower temperatures, in such a way that the temperature in the second or last vessel is higher than the dew-point of the gases for water, or (without the previous prevention of formation of tar and after separation of the tar alone, or tar mixed with part of the water) the water, or part of the water, and tar constituents of lower boiling points can be separated from the gases in two or more vessels, by successive coolings (or coolings and washings); and, generally, the treatment can be applied in a number of successive stages to obtain from the gases all or any desired number of the constituents or extraneous matters.

When, according to this invention, it is required to separate or absorb a constituent or constituents in a pure, or practically pure, condition—that is to say, apart from other constituents, the dew-point of which is near the temperature at which the desired constituents are to be separated—the volume of the gases may be increased in order to raise the gases above the dew-point of any undesired constituent, so that the desired constituents are deposited or absorbed free, or practically free, from any undesired constituent.

This increase of volume can be effected in various ways, such as those described in Patents Nos. 27,567, 27,568, and 28,390 of 1907*—for example, by adding gases or vapours (each being heated or not, and derived from the gases themselves, or from other source) which contain none, or less, of the undesired constituent or constituents, or by slightly heating the crude gases, or by treating the gases with an absorbing liquid which has a higher temperature than the gases themselves.

In the process according to the present invention, the cooling of the gases at one stage may be effected by washing them with a product or products of a further stage or further stages—that is to say, with a liquid or liquids being (or containing) a substance or substances with which the gases, at the given temperature, are not saturated. This is in order to lower the temperature of the gases by evaporation of the substance or substances, and generally by cooling the gases at one stage by washing them with a liquid or liquids derived from further stages of the process. These liquids may be derived from the gases themselves or from another source, and may be used heated or not, according to their nature and the special conditions.

The patentee next proceeds to describe how his present invention can be performed—presuming, for example, that the process is to include the prevention of the preliminary formation of tar.

To prevent the ascension pipes becoming clogged with carbon, they at present have a cross-sectional area which is, in most cases, too great for the amount of gases which pass through them. If they have a smaller cross-sectional area, the ascending gases pass through them at a higher speed, and, consequently, are less exposed to the cooling influence of the walls of the pipes or passages, and consequent deposit of carbon. For the same reason, the pipes or passages which lead the gases from the ascension pipes to the cooling and washing apparatus should have a gradual increase in their sectional area, which increase is in accordance with the number of retorts in communication with them.

Figs. 1 and 2 show, in transverse section and side elevation, the two end portions of a so-called "dry main." The pipe A leading from the main to the first apparatus is fixed at the end B of the main. The cross-sectional area of the main (which may be

* See "JOURNAL," Vol. XCVII., p. 353.

See "JOURNAL," Vol. CII., p. 297, and Vol. CIII., pp. 514, 523.

supposed to be in communication with sixty retorts) is gradually increased from the part where the first ascension pipe C enters up to the part where the last ascension pipe D enters. The communication between the main and the gas-producers may be shut off by the valves E.

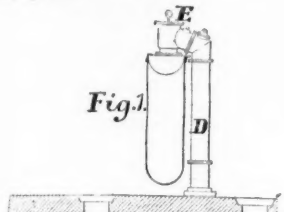


Fig.1.

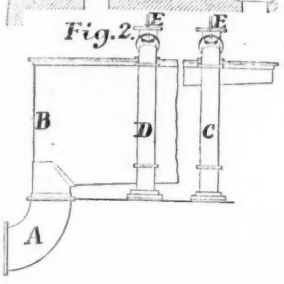


Fig.2.

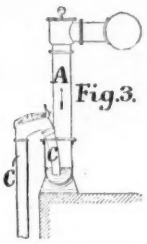


Fig.3.

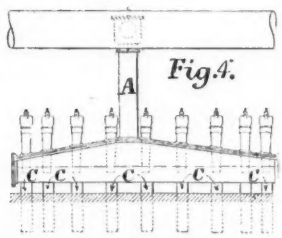


Fig.4.

Figs. 3 and 4 show a hydraulic main with the ends of the ascension pipes C dipping into the liquid in the main. The pipe A leading from the main to the first apparatus is fixed in the middle of the main; and therefore the sectional area of the main is increased gradually from both ends to the middle. If these arrangements be not sufficient to maintain the heat, the pipes or passages leading from the retorts to the condensation plant may be insulated with a non-conductor or bad conductor of heat, or they may be heated in any suitable way—for example, by the hot waste products of combustion from the furnaces, or by their radiant heat, or by putting the ascension pipes and mains into the walls of the retort bench, or so that they derive heat therefrom, or if feasible, the pipes or passages may be short enough to obviate undue cooling.

The gases coming from the retorts enter the first washer at (say) a temperature of 200° C., or a higher temperature. Means are provided to cool the gases in the first apparatus to the dew-point of those constituents which have a boiling point of 300° C. or higher. The dew-point of the gases for these constituents may be 160° C. The gases therefore must be cooled to this temperature. So much of the products with boiling points of, and above 300° C. will be separated as are in the gases above the quantity which corresponds to the point of saturation, and will run off (being in a liquid state) and will become solid at a temperature more or less above or below 70° C. according to the amount of free carbon; while such hydrocarbons as are solid at ordinary temperatures will become solid at a temperature more or less above or below 70° C. The gases coming from the first washer are practically free from free carbon and tar, and contain practically all the gas constituents having boiling points lower than 300° C., and besides this they contain so much of the tar constituents with boiling points of and above 300° C. as correspond to the tension of these substances at the temperature of 160° C. In the second washer, such gas constituents the dew-points of which are from 160° C. down to the lowest dew-point next above the dew-point of the gas for water (say, in the given case, above 80° C., the dew-point for water being 75° C.), will be separated. In order to effect the separation, the gas is cooled from 160° C. to (say) 80° C. The lowest boiling point of the product running off from the washer may be 180° C. Besides products with boiling points from 180° C. to 300° C., this product will contain so much of the products with boiling points of and above 300° C. as corresponds with the falling of the tension of the gas for products with higher boiling points than 300° C. In order to get these products of boiling points of and above 300° C. as much as possible separated from those with lower boiling points, so much of the liquor coming from the second washer is pumped into the first washer as is possible without lowering the temperature in the first washer to under 160° C. If this liquor enters the first washer, there will be a strong evaporation of the constituents with lower boiling points than 300° C., with which the gases are not saturated at 160° C. and above, whereas the constituents with boiling points of and above 300° C., with which the gases are saturated at 160° C., cannot be evaporated. This has proved to be the best means of cooling the gases—a means which at the same time allows a further splitting of the gas constituents than would be possible by simply gradually cooling. Thus a greater amount of products of boiling points of and above 300° C. will leave the first apparatus; whereas the final product of the second apparatus contains less of these products of boiling points of and above 300° C.

In the third washer, products condensed in a further stage of the process—such as water, or oil, or both of these liquors—will be used for the same purpose, and the gases be cooled to (say) 60° C. The dew-point of the gases for water being 75° C., water and oil will be condensed in this washer; and they separate by specific gravity. The oil may be used alone or with water, or with oil coming from the next stage, for cooling and washing the gases entering a preceding washer or washers. To get a fourth, fifth, or further product, the gases may be cooled down further in one, two, or more, stages, to (say) 35° or 25° C., or less. In each stage so much oil and water will be separated as corresponds to the falling of the tension of oils and water.

After completely cooling the gases, the tar constituents will be retained—viz., hydrocarbons of lower boiling points, such as benzol and its homologues—with the vapours of which the gases are not saturated. The gases consequently have a higher illuminating power than they would have if they had been purified by the old method—say, by uniform cooling with simultaneous separation of the gas constituents. In this old method the tar constituents of high boiling points act, by this simultaneous separation, as dissolvents for those of low boiling points. The tension of a substance in solution is always lower than the tension of the same substance in a pure condition; therefore, by the old method, the tar constituents of low boiling points (such as benzol) are separated from the gases, and, consequently, the illuminating power is diminished. So that, in the old method, gas constituents of lower boiling points and valuable for illuminating are absorbed by the tar, from which they must be regenerated by special treatment; while according to this invention they are retained in the gases.

If it be required to separate these constituents from the gases, the gases, after the last cooling, or in the last cooling vessel, are washed with a tar oil or with tar oils of high boiling points from former stages of this process. Such tar oils of high boiling point have, at the given low temperature, a very low tension; and, as they are separated from the gases themselves, the gases are, according to the low tension of the substances, saturated with them. Consequently, in using such tar oils for the extraction of benzol and its homologues, the gases will not evaporate and absorb such oils, but, on the contrary, as the volume of the gases is diminished by the extraction of benzol vapours, small amounts of vapours of wash-oils and of other high boiling tar constituents will be separated from the gases, which will consequently become purer. The light oils absorbed in the washing oil are separated from the washing oil or oils by distillation; and these can be used over and over again. By this constant circulation of the washing oils, certain impurities will accumulate in them. As soon as the amount makes the oils unfit for benzol extraction, they are used in a former stage of the process—say, in the first, second, or other washer. The oil or oils will be evaporated by the gas and regenerated in a further stage in its original pure condition. The impurities are retained in the product of the washer in which the impure oils are used for cooling and washing.

Instead of starting with a temperature of 200° C. or above, the first washing or stage of the process—say, the separation of pitch and tar—may be effected at a temperature below the dew-point of water if only the lower boiling gas constituents are required to be separated from the tarry matters.

If the gases contain ammonia, cyanogen, and the like, the water condensed will absorb part of this. In this case, the method described in patent No. 26,262 of 1905 (already referred to) may be used to reconduct the ammonia into the gas to be separated afterwards. If the extraction be effected in such a way that the gas is at the same time cooled, the extracted substance will be contaminated with tar oils, or diluted by water of condensation; but contamination or dilution of the desired constituent by an undesired constituent can be prevented, as already described, if the volume of the gas be increased above the dew-point of the undesired constituents, so that they are not separated. This can be effected, for example, by using a washing material (in which the ammonia or other extraneous substance is to be absorbed) with a higher temperature than the temperature of the gases themselves. If (say) the absorbing agent be dissolved in hot water which has a higher temperature than the gases (even though it be but to a small amount), the hot water will raise the heat of the gases, and thus the now unsaturated gases will evaporate part of the water, and the volume of the gases will thus be raised above the dew-point of the undesired constituent by the water vapours.

If the special conditions would not allow of preventing the formation of tar, the patentee proposes to first separate the tar and then those tar oils and other gas constituents from the gases which, according to the temperature of the first stage, are not present in such quantities that the gases are saturated with them.

Novel Mode of Construction of a Gasholder at Innsbruck.

A new three-lift gasholder of 565,000 cubic feet capacity, having an iron tank and fourteen guide columns, has been erected at the No. 2 Gas-Works at Innsbruck. It was constructed by the Witkowitz Iron-Works, according to the scheme of Herr Baumann, the Engineer of those works. The special point of the scheme was that both the tank and holder were constructed from the top downwards. The portions of the holder and tank which had been already riveted were lifted by suitable jacks by the height of one row of sheets at a time. Almost all scaffolding was thus dispensed with, and considerable economy of the cost of construction is reported to have been effected. The "Journal für Gasbeleuchtung" points out, however, that the gasholder at the Tegel works in Berlin—particulars as to which have appeared in the "JOURNAL"—was erected in a similar fashion.

THE LIGHTING INDUSTRIES IN GERMANY.

The annual report issued by the Berlin Chamber of Commerce contains a review of trade conditions prevailing during the past year in the gas industry and its dependent and rival trades. An abstract of the report has been published in a recent number of the "Zeitschrift für Beleuchtungswesen," from which a few of the particulars of interest to English gas men may be quoted.

So far as the manufacture of petroleum burners was concerned, there was little change in the export from Germany to other European countries. The manufacture of incandescent petroleum lamps, however, showed a considerable increase. There was a marked decrease in the manufacture of ordinary upright incandescent gas-burners, owing mainly to the greatly extended production of inverted burners. It is remarked that, on account of the economy and high illuminating power of the inverted gas-burner, it is frequently preferred to electric light. Many types of inverted gas-burner are reported to be faulty because the effect of change of pressure of the gas supply is not overcome, and consequently smoking is apt to ensue. The export trade in inverted burners was particularly brisk, more especially to England. Comprehensive patent rights precluded the export of inverted burners from Germany to France.

The raw materials for the manufacture of mantles, particularly thread and thorium, rose in price considerably during the year. There was no change in the sources of supply. Wages were higher, while the selling price of mantles fell appreciably in consequence of the keener competition. The manufacturers of gas fittings and burners suffered greatly through the high prices of materials, which continued to rise till April last year. The fall in the price of copper in the latter half of the year had a marked effect on the prices obtainable for manufactured goods containing it, though large stocks had been laid in when the higher prices prevailed. There was great activity in the supply of gas-meters and other appliances for the use of gas-works. About 100 new gas-works were constructed in Germany, and there were great extensions at some existing works. The fall in the prices of raw materials generally in the latter half of the year was favourable to the firms undertaking this class of work. The high rate of interest which prevailed in the Money Market, however, prevented many small towns from proceeding with the erection or reconstruction of gas-works. The high import tariffs of most countries curtailed export business. In particular, the export of gasholders to Austria has been thereby rendered impossible, and German firms have in many cases made arrangements with Austrian works for the erection of holders, while they supply drawings and supervision. The increase in the rates of wages on gas-works is reported to have led to the rapid introduction of methods which result in economy of labour. For instance, the use of vertical retorts, so far as can be judged at present, has, it is stated, cheapened the manufacture of gas by from 4½d. to 6½d. per 1000 cubic feet. The supply of gas to small towns and to outlying places has been greatly facilitated by present methods of distributing gas at high pressure to a distance from existing gas-works. There was comparatively little business done in the erection of gasholders of any considerable size. There was marked depression in the fittings trade—more especially in regard to electric light fittings; and prices were lower.

Extension of the Berlin Municipal Gas Supply.

It is reported that plans have been got out for a new large gas-works for the Municipality of Berlin. This works, which is to be on the Oberspree, is to be of the same size as the new Tegel works, of which the cost of construction is reported to have been about 3 millions sterling. At the end of the year, nine new suburbs of Berlin are to be supplied with gas from the municipal works—making the district of supply outside the municipal boundary considerably larger than that within it.

Scraping Water-Mains at Halifax (N.S.).—Scraping water-mains at Halifax (N.S.) was first done in 1875, using a scraper on the end of iron rods pushed through the mains by hand. In 1885, a self-propelling Scotch scraper was bought; and in the year 1887 an improved form of this machine was constructed by Mr. E. H. Keating, the then City Engineer. Since 1881, the mains have usually been scraped twice a year, at an average cost of $3·28 per mile for each cleaning. A 24-inch low-service main, 13,400 feet long, has been cleaned annually for more than 25 years at an average cost of $15·07 for each of the scrapings; and a high-service main of similar diameter, 36,340 feet long, at an average cost of $18·80. Between 1882 and 1904, a total of 223 miles of mains have been cleaned. The mains are provided at numerous points with special boxes into which the scrapers are placed after emptying the pipes. The water is then turned on by a proper manipulation of the gates, and the pressure drives the scraper along until the end of the main to be cleaned is reached, where it is removed. Enough water escapes through the valves ahead of the scraper to wash away the incrusting material and keep it from sticking; and this material is removed also by the operation. The main is afterwards flushed until all sediment is removed; and the removable length in the special box is then replaced, and water turned on to the distribution-pipes.

REGISTER OF PATENTS.

Treatment of Coal-Gas to Obtain Tar Constituents and Ammonia.

FELD, W., of Hönningen-on-the-Rhine, Germany.

No. 20,139; Sept. 9, 1907.

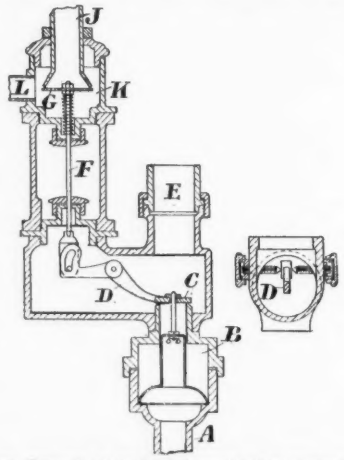
This invention, which has for its object "to effect the obtainment of extraneous matters, such as tar constituents, and ammonia from coal-gas and analogous gases in a more economical and efficient manner than hitherto," is fully described on p. 58 of to-day's issue of the "JOURNAL."

Gas and Water Valve.

FLETCHER, RUSSELL, & CO., LTD., NEIL, A., and FLETCHER, T. W., of Warrington.

No. 23,457; Oct. 24, 1907.

This valve is intended to be employed in combination with heating apparatus for supplying hot water in lavatories and like places; the water being caused to pass through coiled pipes fitted over a series of gas-jets in such a way that when the water is turned on the gas is also turned on, and the water and gas are also turned off together.



Fletcher, Russell, & Co.'s Automatic Gas Water-Heater.

The water supply-pipe A is connected to a chamber B in which a hollow piston or plunger (formed with a concave base) slides in the cylindrically formed top of the chamber. On the cover C is connected one end of a lever D, in a closed chamber to which the water outlet E is fitted. The opposite end of the lever has a radial slot in it. It is connected to the lower end of a vertical rod F by a pin passing through the slot. The upper end of the rod is connected to a plate covering the mouth of a gas-inlet J to the chamber K that has an outlet L for gas on one side leading to the heating apparatus.

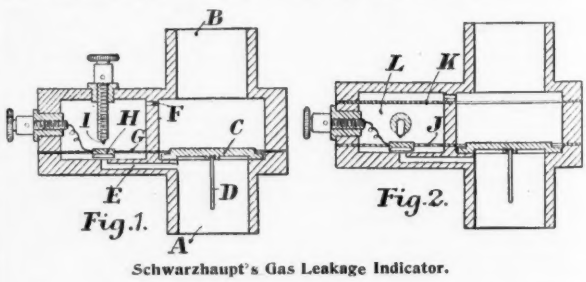
The water when turned on passes from the inlet A up the hollow piston, thereby raising the plate C connected to the lever D. The water enters the chamber through apertures in the hollow piston, and flows through the outlet E to the coiled pipes or other form of heating apparatus. The cover-plate C rising by the action of the water causes the opposite end of the lever that is attached to the rod F, connected to the plate G covering the gas-inlet J, to draw down the rod and open the gas-inlet—the gas passing to the burners through the outlet L, where it is ignited by a pilot light. When the water is turned off, the inlet A is closed by the back-pressure of the water in the outlet pipe E, and at the same time the gas-inlet J is closed by the action of the piston on the water-inlet as described.

Indicating Leakages in Gas-Pipes.

SCHWARZHAUPT, A., of Lüdenscheid, Westphalia.

No. 27,091; Dec. 7, 1907. Date claimed under International Convention, Dec. 8, 1906.

This apparatus, for indicating leakages in gas pipes or conduits, closes an electric circuit as soon as the gas begins to escape.



Schwarzhaupt's Gas Leakage Indicator.

Fig. 1 shows one mode of constructing the indicating apparatus. This is altered in fig. 2 in such a manner that, instead of an ordinary electric contact apparatus to which the gas has access (although it may

not constantly stream past it), a contact apparatus entirely shut off from the gas is arranged.

In fig. 1, A is the inlet and B the outlet of the gas stream in the main gas-pipe. The gas, on its way from A to B, encounters a disc-valve C, which is controlled by the bar D, and is sensitive to the smallest quantity of gas. Under the valve (in the direction of the gas in front of the valve), a canal E branches off, and ends in a side chamber. A second canal F branches off above the valve, and ends also in a side chamber —both chambers being separated by a very sensitive membrane or tissue G. As soon as a gas stream passes from A to B, a difference in pressure takes place in front of and behind the valve—a difference communicated by the canals E and F to the two side chambers, and in consequence the membrane G is lifted up. The electric contact H located on this membrane thus comes in touch with the second electric contact I, whereby the indicating circuit is closed. Even when the quantity of escaping gas is so small that it can pass through the leaks of the valve without overcoming the not inconsiderable weight of the valve-disc C, a sufficient difference in pressure is felt in the side chambers to raise the membrane.

In fig. 2, instead of one membrane, two superposed membranes J K are used. Thus a compartment L is obtained (which is closed in all directions) in which the electric contacts can be placed without their being in any way exposed to the gas. As the air in the compartment cannot escape anywhere, each of the membranes is forced to follow the movement of the other.

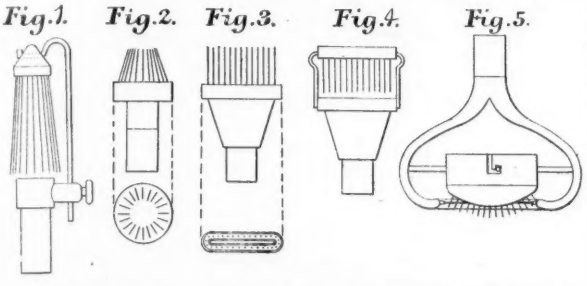
Filaments for Illuminating and Heating Purposes.

[The "Buisson-Hella" Light.]

MICHAUD, G., and DELASSON, E., of Montreuil (Seine), France.

No. 4461; Feb. 27, 1908. Date claimed under International Convention, June 10, 1907.

This patent relates to processes for the manufacture of, and to means for obtaining in a continuous manner, a filament formed of alumina, magnesia, silica, or lime, fused and employed together or separately after the addition to them of thoria, ceria, or any other oxides of the rare earths—the bodies selected being agglomerated with black soap.



For the radiant non-conducting envelope, there are first of all mixed: Thoria, 99 parts; ceria, 1 part; chromium sesquioxide, traces.

The patentees then take 80 parts of weight of the mixture, and 20 parts of pure alumina; and to this final mixture black soap is added as agglomerant.

The process of manufacture consists, broadly, in placing the mixture of the constituent substances in special nozzles or tuyeres, from which a suitable press forces them into an infusible vertical passage traversing an electric furnace of special arrangement and ending in a reservoir where the filament, after fusion, is automatically cut to the desired length.

It has already been proposed, the patentees point out, to produce an illuminating body by using a powder composed of silica and a trace of calcium, reducing this powder to a consistency suitable for kneading by mixing it with tar and cement, or with a mixture of kaolin or bauxite and water, and then moulding the resultant compound to any desired shape. The article thus produced is dried at a moderate heat, and then immersed in a bath composed of a strong solution of suitable salts of the rare earth metals. It is then subjected to heating up to 4000° Fahr. and allowed to slowly cool—completing the operation. In making up the paste, the oxide of one or more of the rare earth metals could be used with water or one of the solutions together with an oxide. Similarly, it is not novel to press plastic refractory substances through nozzles so shaped as to form two concentric filaments or a filament that is like pinion wire with a central hole, nor is it novel to employ an electric arc for heating the plastic mass to transform it into filaments. But what is claimed by the inventors (apart from the plant required to press the mixture into the proper shapes) is some applications of the filaments to appliances for lighting and heating by gas in the atmosphere, though it is not intended to claim them as being novel *per se*. Fig 1 is a conical suspended mantle;* fig. 2 is a conical mantle fixed by its base; fig. 3 is a flat mantle fixed by its base; fig. 4 is a suspended flat mantle; and fig. 5 is a circular mantle for an inverted burner.

Gas-Ovens.

WILSON, J. W., of Armley, near Leeds.

No. 8108; April 13, 1908.

This invention has for its object the construction and arrangement of a gas-oven in such a manner that it may be readily taken apart for cleansing or other purposes, and be rapidly put together again. Further, the arrangement prevents undue loss of heat from a gas-oven, or the like, through radiation. This is one of the patents referred to in an illustrated article published in the "JOURNAL" for May 26 last, p. 494; and further detailed notice of the invention need not here be given.

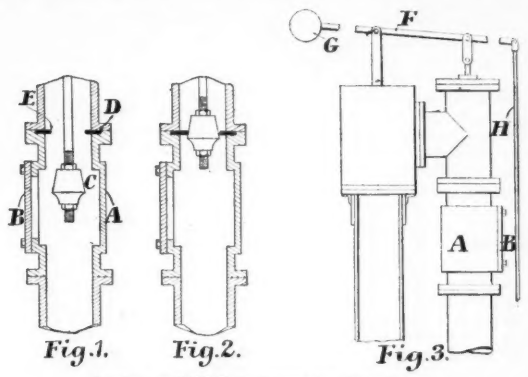
* This arrangement was shown, attached to a burner, in the "JOURNAL" or Aug. 4 last. p. 302.

Valves for Ascension Pipes.

LAYTON, A. E., and WHITE, E., of Redditch.

No. 11,184; May 23, 1908.

To decrease the stoppage in pipes connecting gas-works retorts with the horizontal main, the inventors propose to employ a valve carried in a box fixed vertically with flanges connecting the ascension pipe with the horizontal main, either with or without bridge-pipes. The valve-box has a door, so as to give access to the valve for cleaning, adjustment, or repairs; and it is formed conical at both the upper and lower parts, in order to ensure tight-seating when closed and cause any deposit to be removed when coming in contact with the seat. The seat for the valve is annular in form (as shown), with the inner edge semi-circular



Layton and White's Ascension-Pipe Valve.

in cross section, "thereby ensuring a tight joint without injury to the valve." To operate the valve from the charging floor, a rod and lever are attached (within reach of the stoker), and secured with a catch when the valve is required open—the balance-weight closing the valve when the catch is released during the charging of the retorts.

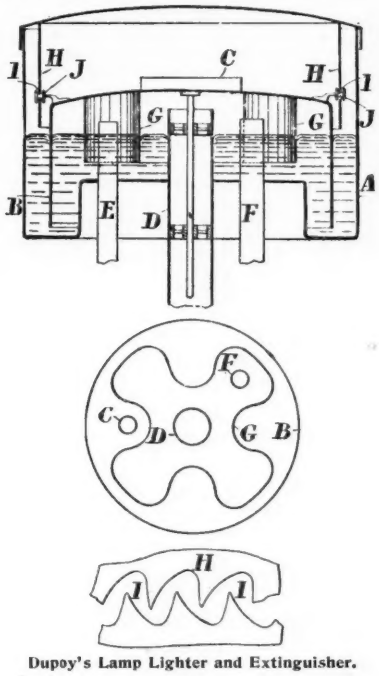
Fig. 1 shows a sectional elevation of the valve and box. A is the box; B, the door; C, the conical valve; and D, the annular seat with the semi-circular seat E. Fig. 2 is a section with the valve closed. Fig. 3 shows an elevation of the box A connected in position. F is the lever with the balance-weight G; and H, the operating rod.

Lighting and Extinguishing Gas-Lamps from a Distance.

DUPOY, J. R., of Paris.

No. 12,487; June 10, 1908. Date claimed under International Convention, June 11, 1907.

This apparatus consists essentially in the combination of a vessel containing liquid (from the surface of which emerge the gas-supply pipe and the pipe feeding the lighting burner), of a bell dipping into the liquid and furnished with an internal partition of star shape whose profile is such as to establish or break connection between the gas-supply pipe and the feed pipe for the lighting burner, according to the position of the bell. There is also an arrangement adapted to communicate to the bell,



Dupoy's Lamp Lighter and Extinguisher.

when it is moved vertically under the action of an excess of pressure sent into the system, an angular displacement which has for effect to reverse the distribution.

The vessel A contains liquid (mercury, for example) placed at any convenient position in the lantern; and a bell B dips into the liquid—being provided with a regulable weight C, which is determined according to the pressure under which the apparatus is to work. Above the level of the liquid there emerge the gas-supply pipe D; the pipe E, which feeds the lighting burner; and the pipe F, which feeds the pilot burner serving to ignite the lighting burner. The bell is divided by an inner partition G into two compartments—a central one, with which the gas-supply pipe is constantly in communication, and a peripheral one completely isolated from the gas thus supplied. The wall G is of star-form, so as to establish communication between the gas-supply pipe and one of the pipes E or F (the pipe F in the case illustrated) and to isolate the other pipe (say, E). Under the conditions shown, the pilot burner alone is fed.

The partition G is in one with the crown of the bell; but it only occupies a portion of the height of the bell, so that there may be communication between the supply pipe D and both the pipes E and F at the same time when the bell reaches a certain level. The position of the bell in relation to the pipes E and F is determined by a guide-ring H, fixed to the cover of the vessel and presenting a sinuous groove I, constituting a cam in which friction rollers J, carried by the bell, engage. The form of the groove is such as to impart to the bell, when it rises and when it returns to its initial level, the angular displacement required to produce the reversal of the distribution.

When in operation (the apparatus being in the position shown), only the tube F, which feeds the pilot burner, is in communication with the gas supply; the tube E, which leads to the lighting burner, being, on the contrary, isolated from the gas supply by the partition G. When the lighting of the burner is to be effected, there is sent into the main system a momentary excess of pressure determined in such manner as to raise the bell weighted at C. At the moment when the bell arrives at the top of its course, the lower edge of the partition G rises above the level of the liquid, so that both pipes E and F are in communication with the gas supply. The pipe E is thus fed with gas, which is ignited at the outlet by contact with the flame of the pilot light fed by the pipe F. The lighting being thus effected, the pressure in the system is reduced to its normal value, whereupon the bell again descends, under the action of its weight, to its initial level.

During its rising and falling movements, the bell receives, in consequence of the guiding of the rollers J in the sinuous groove I, an angular displacement, such that, at the end of the movement, the pipe E, feeding the lighting burner, occupies a position in the interior of the central compartment of the bell so as to be in communication with the gas supply; while the pipe F (which feeds the pilot burner) becomes, on the contrary, isolated from the gas supply by the partition G. The distribution of gas is thus reversed.

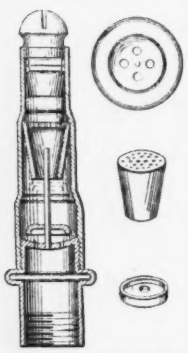
When it is desired to bring about the extinction of the lighting burner, it is sufficient to send momentarily, as in the preceding case, an excess of pressure into the system, so as to transmit to the bell a fresh angular vertical movement, which has for effect to produce a fresh reversal of the distribution—the pilot light, after becoming ignited by contact with the flame of the burner, then alone remaining lighted, and so on. Thus by sending an excess of pressure into the system there is alternately produced the lighting and extinction of the burners.

Gas-Burners.

HARRISON, T. B., of Philadelphia, U.S.A.

No. 6445; March 23, 1908.

The inventor provides a gas-burner wherein the upper end of the plug is concave with a series of perforations, and wherein a valve disc is employed to close the lower end of a hollow tapering thimble when the pressure of the gas is excessive; the valve being mounted upon a shaft or spindle secured to, and rising vertically from, the concave upper end of the plug. The thimble is secured within the burner-tube and receives the upper end of the shaft or spindle.



Harrison's Regulating Gas-Burner.

The illustration shows a central vertical section through the burner, a plan view of the plug or fitting at the lower end, a perspective view of the hollow tapering perforated valve-seat, and a perspective view of the sliding valve-disc, looking at the under side.

The fitting is interiorly screw-threaded to fit an ordinary gas-supply pipe, and the upper end (also screw-threaded) is preferably concave and provided with a series of perforations. A wire shaft or spindle in the concaved top of the fitting extends upward into a hollow tapering thimble having a perforated top, and being secured in place in the burner-tube. An aluminum valve disc, having a central aperture, is mounted upon the spindle to slide freely on it.

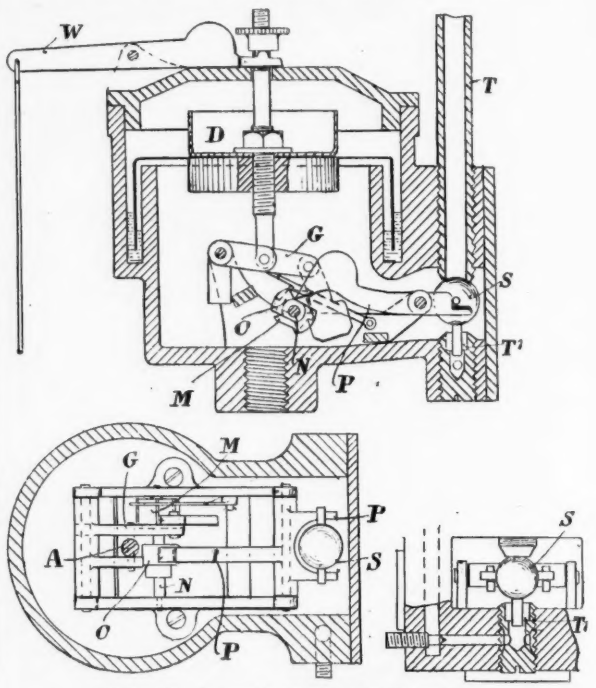
When the gas is turned on through the burner, if the pressure is excessive, the aluminum disc rises upon the spindle to a position to regulate the flow of gas through the burner. Should the pressure be sufficient, the valve disc would rise to the position shown in dotted lines; and then the full pressure of gas passes through the perforations, but permits only a slight flow to pass through between the top part of the valve disc and the seat of the valve.

Automatically Lighting and Extinguishing Gas-Lamps.

ZICKWOLFF, E., of Siegen, Westphalia.

No. 9892; May 6, 1908.

This automatic lighting and extinguishing apparatus is of the type wherein the alternate opening and closing of the gas-orifices for the principal flame and igniting flame are effected by impulses or waves of pressure transmitted through the gas-pipes to act on a membrane, bell jar, or the like connected to a valve-lever. The essential feature of the arrangement is that the rod of the bell float engages the longer arm of a double-armed lever, the shorter arm of which forms the closing member of the gas-conduits. In practice, it has been found that it is not always possible to press the closing member against the valve-seat leading to the main burner so that a perfectly tight closure is made. In course of time foreign matter accumulates on the seat and closing member; and if the latter is only gently moved against the seat, these impurities prevent the making of a tight closure. To obviate this disadvantage, a controlling device member with a cam disc (of a type already known in connection with pressure-operated igniters) is arranged between the rod and the controlling lever, with the longer arm resting on the disc; and when sliding from the cam this arm falls and causes the closing member to strike the seat.



Zickwolff's Automatic Lighter and Extinguisher.

The first illustration—a vertical section of the mechanism—shows the conduit leading to the main burner-orifice closed; the others are a horizontal section, and a front view partly in section.

A rod A is connected to a bell jar D, partly immersed in liquid in an annular chamber. The rod is connected to a lever G, from the free end of which a dog is suspended, which is adapted to engage a ratchet-wheel M fixed to a shaft, to which is also fixed a cam O. The weighted valve-lever P rests upon the cam, and the shorter arm of the lever engages the valve-body S. The latter is movable between the orifices of two ducts T T¹, which lead respectively to the main burner-orifice and to the igniting burner-orifice.

If a wave of pressure is sent through the gas-main, the bell jar D is lifted and actuates the mechanism; the shaft N being rotated through an angle, which causes the lever P to be lifted by the cam O. This causes the valve S to be lowered on to the orifice of the conduit T¹ leading to the igniting burner, and the igniting flame is extinguished—the conduit T having been meanwhile opened by the lowering of the valve. The next actuation of the mechanism causes the lever P to slide off the cam O and to thrust the valve S with a suitable amount of force against the orifice of the conduit T. By this means the valve is thrust firmly against its seat and displaces any impurities deposited thereon. The next actuation of the mechanism causes the conduit T to be re-opened and the conduit T¹ to be closed.

Preferably some of the cam-surfaces are made of such length that several actuations of the mechanism must take place before the lever P slides from the cam and closes the conduit T. In a street-lighting system the igniters may then be so distributed that a single wave of pressure causes all the lamps to be lighted, while the next wave causes alternate lamps to be extinguished—the remaining lamps being extinguished by the third wave.

To allow of actuating the mechanism by hand, a lever W is fulcrummed on the cover of the casing, and engages the rod A. It has a chain or cord connected to it, by means of which it can be actuated for lifting the rod—an arrangement enabling individual lamps to be separately lighted and extinguished.

Electric Light Failure at Ashton-under-Lyne.—Much inconvenience was caused in Ashton-under-Lyne on Monday of last week by a failure of the electric light, which deprived many of the tradesmen of their sole means of illumination. It is, however, an ill wind that blows no one any good; and those establishments the proprietors of which had been wise enough to instal incandescent gas lighting naturally gained by the contrast. The District Education Committee were holding a meeting at the time; and the business remained at a standstill until the Deputy-Clerk procured a bundle of tapers. All the members then secured possession of lighted tapers; and we are told that, "as they sat in semi-circles, the scene, with about forty tapers burning, was somewhat weird."

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Mr. C. F. Ruggles's Address to the Eastern Counties Gas Managers' Association.

SIR,—I was much pleased and interested in reading this very able address reported in the "JOURNAL" of the 29th ult.—especially the part referring to the Commercial Sections, the overstocking of coke, and coke being sent from one works into another district, and therefore sold in competition with the works where delivered. This portion of the address appeals to my process of treating coal through carbonization, and producing "Coalexld" in place of ordinary coke. By the use of my patented process, the residual—namely, "Coalexld"—is produced, which is a very good domestic fuel; being free from sulphur, having no clinker, and the percentage of ash being also reduced. I had before me, in perfecting this process, the wish to make the fuel a household commodity, and by so doing to enable gas managers to dispose of all their coke in their own districts, without having to dump it down on their neighbours, and therefore having the effect of reducing their neighbours' prices.

Wherever "Coalexld" is made, being so improved in quality, it finds a very ready and increased sale for domestic use, bakers, blacksmiths, and general iron workers, and also for suction gas plants and other purposes. I am convinced from experience that, when "Coalexld" is more widely known among gas managers and engineers, there will be no further complaint of being over-stocked with coke, as the daily sale will keep pace with the output, and the savings in wastage. A very easy test of its advantage can be carried out in the gas-works by using it in the furnace for heating the retorts; and an increased calorific value will be found, as well as a reduction in clinker.

In all cases a higher price has been obtained, which covers the extra cost of chemicals, and an extra profit, besides the increased advantage in the gas—a little higher illuminating power, and a considerable reduction in the sulphuretted hydrogen.

Bolton-le-Sands, Oct. 3, 1908. J. JOWETT.

LEGAL INTELLIGENCE.

A GAS-MANTLE TRADE MARK CASE.

A Penalty of Twenty-Five Pounds.

At the time of the hearing of a prosecution under the Merchandise Marks Act at the Leeds Police Court, the Stipendiary Magistrate (Mr. C. M. Atkinson), as recorded on p. 865 of last week's "JOURNAL," promised, in view of an appeal, to put his judgment in writing; and this he has since done. The defendants were Messrs. F. W. Jeffery and Co., Limited, of Leeds; and at the previous hearing of the case Mr. Atkinson held that they had committed a breach of the Act by selling incandescent mantles under the name of "Jefco"—the prosecuting firm (the Provincial Incandescent Fittings Company, of Manchester) having registered as a trade mark for mantles the word "Jepco."

In his judgment, Mr. Atkinson reviewed the evidence that had been brought forward in the case, and said "there was a suggestion that the defendants were unaware of the existence of the trade mark; but seeing that it had been constantly used since 1904, and prominently advertised by the prosecutors, he could not accept the statement that its existence was unknown to men who were largely employed in the same business as the prosecutors, and had been so employed for many years. Indeed, one defence put forward was that the defendants had cause to believe that the "Jepco" mantles had been withdrawn from the market. It was also suggested, although not strictly proved, that the defendants had registered the word "Jefco" at Stationers' Hall. But, even if this were so, such registration could not operate as a defence on the present charge, nor, indeed, confer any legal right on the defendants. Certain mantles bearing the mark "Jefco" were seized under a search warrant, and brought before the Court. There would be a penalty of £25, out of which the prosecutors would have their costs of the hearing; and the mantles (37 in number) brought before the Court would be forfeited. He added that these mantles had better remain with the officer who had charge of the case, until the expiration of the time during which an appeal could be lodged.

Illegal Use of a Public Watering-Trough.

Among a number of defendants who appeared before Mr. Brierley at the Manchester Police Court last Wednesday to answer summonses for non-payment of their water-rates was a man who occupies a stable in the vicinity of New Cross, and who has a horse and lorry. The charge was for 3s. 6d.—being a half-year's rate for water used in defendant's stable, though he had no tap; and he made a strong objection to it. The Magistrate asked the collector how a person could be held to be liable when his water was cut off. It was explained that a consumer, if he carried water, was still liable, but the charge was less than if he had a pipe taken into his premises. The defendant said he did not carry water. What he did was to take his horse to the trough at New Cross two or three times a day. He did not see that a man could be charged for using a public watering-trough. He never carried water to his stable. His Worship put it to defendant whether it was not rather a mean thing to escape payment of the water-rate by taking his horse to the public trough. He replied that he had done it for three years. Asked how he obtained water to swill his stable, he said it had not been swilled for fifteen years. He had been the tenant for four years, and water had never been carried in his time. As far as he knew, his lorry had not been washed either. His Worship made an order for payment of the amount due.

Ownership of Money in a Gas-Meter.

At the Old Street Police Court, on the 26th ult., a married woman named Julia Morrish was charged with stealing money from a penny-in-the-slot gas-meter; and a question was raised as to whether the money was the property of the supplying Gas Company (the Commercial) or whether possession had passed by the coin being placed in the meter. The facts were somewhat different from the ordinary run of cases of stealing from gas-meters, inasmuch as the prisoner was the wife of the rentee of the meter; and the money in question was, or had been, her own or her husband's. According to the evidence given by an inspector of meters in the service of the Company, the drawer of the meter had been tampered with, and the money taken out—the index showing that 6s. 11d. should have been in the money-box. Of course, the money had been put in in order to obtain the supply of gas; and the Magistrate (Mr. H. C. Biron) started the suggestion as to possession having passed. Mr. Frowde-Phelps, who prosecuted, said he had not heard any question raised as to the ownership of the money in a penny-in-the-slot meter. The property in the meter remained with the Company, as it was only rented. What was contained in it was therefore the property of the same owner. It was mentioned, however, that the tenant on whose premises the meter was placed was, by the conditions of the hiring, held liable for the amount which the index from time to time showed to be due; and the question raised by a case tried in a London police court some time ago was decided in favour of the gas company, on the ground that possession had not passed till the money was collected by the company's agent. The prisoner pleaded guilty to taking the money; and Mr. Biron, without further reference to the point raised, bound her over, under the Probation Act, for three months.

Charge of Conspiring to Defraud.

At the West London Police Court, last week, John Culling, clerk, Charles Tyler, gas-fitter, and Augustine E. Beare, gas-fitter, were charged, on remand, with conspiring to defraud their employers, the Gaslight and Coke Company, at High Street, Kensington. Culling was also charged with falsifying the accounts. Mr. Robert Humphreys, who prosecuted, stated that Tyler and Beare had been three years in the service of the Company; and Culling had worked himself up into the position of a clerk from that of a fitter. Culling's duty was to see what work a fitter had done in the week, and pay him accordingly. Under ordinary circumstances, the number of hours was determined by an automatic clock, which punctured the workman's ticket on his arrival and departure; and the times thus recorded were entered by Culling on the analysis of wages sheet. But, in addition, the defendant had to check the overtime; and the evidence—in fact, Culling himself had made a full confession—would show that he had altered the figures on the automatic time-sheet, the analysis of wages sheet, and the overtime-sheet. As regarded Tyler and Beare, it would be proved that on several occasions—three in the case of Beare, and five in the case of Tyler—they received more money than they were entitled to; and, according to Culling's confession, they had divided with him the surplus money thus obtained by the falsification of the sheets. Evidence was given by Mr. Arthur Faithful, clerk in the costs department, who produced several time-sheets—all in Culling's handwriting—in which falsifications had been perpetrated. In some instances the whole time-sheet was a forgery. The documents showed that on some occasions the defendants Tyler and Beare were represented as having been paid sums of money varying from 5s. to 9s. 6d. beyond what they had earned. Defendants were again remanded.

Conviction for Theft of Gas-Fittings.—At the Aston Police Court, on Monday last week, Edward Messenger, a rag gatherer, was charged with stealing a chandelier, a number of gas-brackets, and 3s. 9d. in money, the property of the Birmingham Corporation, from a void house in Thomas Street, Aston. After the evidence had been heard, Mr. Prideaux mentioned that the Corporation had thousands of these fittings in Birmingham and the vicinity, and the Gas Committee were continually receiving complaints of them being stolen from void houses. In most cases the offenders could not be traced; and therefore the Committee felt that when a case was proved the thief should be severely dealt with. Prisoner was sent to gaol for three months, with hard labour.

Suicide by Inhaling Gas.—Joseph Coakley, aged 35, a clerk, of Daresbury Street, Cheetham, who had twice lost situations owing to his intemperate habits, became depressed, and committed suicide by inhaling gas. At the inquest on Monday last week, the Coroner (Mr. Ernest Gibson) commented on the frequency of cases of suicide of this kind, and said that he could not help thinking there was some sort of suggestion going on. Whether it was through harmful literature describing how such suicides took place, or through the details being published in the papers, he could not say; but he thought he was justified, in view of the frequency of these suicides, in asking the Press not to give the details in these cases. If this course were followed, the probability was that the epidemic would cease.

Success of Profit-Sharing in the Leamington Priors Gas Company.—The half-yearly meeting of this Company was held last Tuesday. The report and the accounts presented were adopted, and dividends of £1 per share on the "A" shares, 14s. per share on the "B" shares, and 5s. 7d. per share on the "C" shares were declared. The Chairman (Mr. E. Wright) reported that the gas-mains had been extended to Radford, and that the Company had already fixed there 39 prepayment and 9 ordinary meters, and had orders to put up a few more. They had also fixed 36 cookers. The consumption of gas continued to increase, and there were at present in use in the town 2127 prepayment meters and 2701 cookers. He also reported that the profit-sharing scheme now in operation was giving satisfaction both to the Directors and the workmen.

MISCELLANEOUS NEWS.

BRITISH GASLIGHT COMPANY, LIMITED.

The Half-Yearly General Meeting of this Company was held last Wednesday, at the London Offices, No. 11, George Yard, E.C.—Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. A. W. Brookes) read the notice convening the meeting, and subsequently the report of the Directors, together with (according to the Act) the accounts of the Norwich station. The report was as follows:—

The Directors submit the half-yearly accounts of the Company to June 30, as examined and certified by the Auditors, who have also vouched for the correctness of the several investments held by the Company.

The available profit is £30,323, after deducting the following sums (omitting shillings and pence); Income-tax, £1787; Hull debenture interest, £2137; Norwich debenture interest, £1200; Potteries debenture interest, £665; Trowbridge debenture interest, £166; interest on debenture stock, £2280—total, £8236.

HULL.—The gas-rental shows an increase of £2795, as compared with that of the corresponding period of 1907; the price of gas having been the same—viz., 2s. per 1000 cubic feet. Coke shows an increase of £2599; tar and tar distilling of £503; ammoniacal liquor and sulphate of ammonia, of £795. Coals have cost 14s. 6d. per ton, as against 12s. 6d. Coke has realized 12s. 6d. per ton, as compared with 10s. 11d. The gas sent out was 647,204,000 cubic feet, against 622,845,000 cubic feet in the corresponding period of 1907—an increase of 24,359,000 cubic feet, equal to 3·91 per cent. Of this quantity, 45,772,000 cubic feet was supplied in bulk to the Corporation for the supply of the Old Town. The profit realized is £51 less than the parliamentary interest. This sum will be taken from the reserve fund, leaving a balance of £33,166 to the credit of that account.

NORWICH.—The gas-rental shows an increase of £3787, as compared with that of the corresponding period of 1907; the price of gas having been the same—viz., 3s. 3d. per 1000 cubic feet. Coke shows an increase of £741; and tar and ammoniacal liquor, of £43. Coals have cost 18s. 9d. per ton, against 16s. 5d. Coke has realized 16s. 5d. per ton, against 16s. The gas sent out was 270,367,100 cubic feet, as against 256,336,000 cubic feet—an increase of 14,031,100 cubic feet, equal to 5·47 per cent. The profit realized, after writing off £4000 on account of reconstruction of works, is £1425 in excess of the parliamentary interest.

POTTERIES.—The gas-rental shows an increase of £1450, as compared with that of the corresponding period of 1907; the price of gas having been the same—viz., 2s. 6d. per 1000 cubic feet. Coke shows an increase of £520; tar, of £68; and ammoniacal liquor and sulphate of ammonia a decrease of £119. Coals have cost 11s. 2d. per ton, against 10s. 7d. Coke has realized 8s. 8d., against 7s. 9d. per ton. The gas sent out was 207,919,000 cubic feet, as against 197,963,000 cubic feet—an increase of 9,956,000 cubic feet, equal to 5·02 per cent. The profit realized, after writing off £2500 on account of buildings and plant thrown out of use, is £32 less than the parliamentary interest. This sum will be taken from the reserve fund, leaving a balance of £5183 to the credit of that account.

TROWBRIDGE.—The gas-rental shows an increase of £338, as compared with that of the corresponding period of 1907; the price of gas having been the same—viz., 3s. per 1000 cubic feet, with discounts. Residual products show an increase of £481. Coals have cost 16s. 6d. per ton, against 14s. 11d. Coke realized 13s. 4d., against 10s. 1d. per ton. The gas sent out was 37,833,300 cubic feet, against 35,278,400 cubic feet—an increase of 2,554,900 cubic feet, equal to 7·24 per cent. The profit realized is £447 less than the parliamentary interest.

HOLYWELL.—The gas-rental shows an increase of £29, and residual products of £28. The profit realized is £367.

The available profit added to the previous balance of profit and loss amounts to £76,560. From this sum the Directors recommend a dividend at the rate of 10 per cent. per annum, free of income-tax. This will amount to £24,500, and leave a balance of £52,060.

The Directors who go out of office are Mr. J. Horsley Palmer and Mr. Frederick Wilkin; and the Auditors are Mr. Edward Yardley and Mr. E. Knowles Corrie. They respectively offer themselves for re-election.

The CHAIRMAN, in moving the adoption of the report and accounts, said he had often remarked that the Company was a thoroughly progressive one; and he thought the accounts the shareholders had received, and the report that had been read to them, carried out his statement with regard to the half year ending June 30 last. It was eminently satisfactory that, notwithstanding the slackness of trade which began to be seriously felt during the half year, they could show at a station like Hull (which was soon affected by the conditions of trade in the North), an increase of 4 per cent. At Norwich, the increase was 5½ per cent.; at the Potteries (which was also very easily affected by slackness of trade), 5 per cent.; and at Trowbridge, 7¼ per cent. These figures were remarkably satisfactory to the Directors, and he hoped also to the shareholders. He did not propose to make any lengthy remarks with regard to the accounts, because they were very much the same as were presented to the shareholders six months ago. There was hardly any addition to them, except in the increase in capital. Therefore, he would confine his remarks to some matters of interest which had taken place at each of the stations; and he would begin with Hull. There they had had to spend a good deal of money on capital in the shape of gas stoves, services, pipes, and meters, which showed how their business had increased. One of the features there had been the very large increase in the average consumption of the slot meters. A few years ago—in 1903—the average consumption of the slot meters in Hull was 12,500 cubic feet; now it was 13,500 cubic feet. In 1903, the number of stoves fixed was 6000; now there were 10,350. In addition to this, there was a great demand in Hull for small apparatus in the way of boiling-rings, which seemed to be great favourites in the homes of the working men there. The Company had placed no less than 13,000 of these boiling-rings. Last spring, they introduced what every progressive gas company did nowadays—the delivery of a series of cookery lectures; and the result was that they booked orders after the lectures for no less than 1016 cookers. This indicated that the Directors were perfectly alive to the advantages of gas, and to the necessity for pushing it well in a place like Hull. There was another small matter at Hull which exhibited the progressiveness of the Company. The Directors had been for some time dissatisfied with the accommodation provided at the station for their workmen; and they always felt that, unless they could give the men good accommodation in which to have their meals and to cleanse themselves, they did not do their best work, and were liable to feel that the Directors did not take a keen interest in their welfare. Consequently they had erected during the summer (they were only opened the other day) some handsome mess-rooms and washing accommodation for the workmen. The cost was certainly about £2000; but he believed it would amply repay the Company indirectly in the better working of their employees. Six months ago he told the shareholders the Board were going to issue some fresh capital in the shape of debentures on the Norwich station, authorized by the Act of 1903. It was money that was absolutely required, and they offered these 4 per cent. debentures at first to the Norwich consumers. A certain amount was taken by them; and the balance was offered to the shareholders. He was, however, sorry to say they did not seem to realize the excellent investment that was offered to them, for they only took up a small portion of the amount; and an equal portion was placed among the friends of the Directors. The result was that out of £35,000, they had only placed £30,000; and the Board had still the balance of £5000 to be issued. In connection with the issue of capital by the Company, it was appropriate that he should give a few figures with reference to the increase of the business, to show how very largely it had grown, and how necessary it would be in the future—he did not say in the immediate future—to issue more capital. The figures he had had drawn out were as follows: The increase in the business at Hull in the last ten years was 50 per cent.—that was to say, the amount of gas sold in 1898 was 828 million cubic feet, and now it was 1250 millions. At Norwich, the increase was no less than 84 per cent. in the decade. They were now selling there 509 million cubic feet, against 276 millions in 1898. At the Potteries, the increase was 26 per cent.; in volume the sales being now 370 million cubic feet, against 293 millions in 1898. At Trowbridge, the increase in the same period had been 63 per cent.; while at the Holywell station, it was 25 per cent. This showed that the Company was a thoroughly progressive one, and would require more capital as the progress continued. At Norwich, they had also had a considerable increase in the number of houses fitted up, and also an increase in the number of slot meters and stoves connected. The same might be said with regard to the Potteries. They had still had to go on laying mains to supply people with all these requirements. Looking to the future, he was glad to be able to report that the Board had concluded contracts for coal for the coming winter and next spring at a considerable reduction. At Hull, the contracts would be 1s. 3d. per ton less than last year, at Norwich 1s. 6d. (or really 1s. 10d., taking off, too, the reduction in freights); and there would be reductions at the other stations. There he came in touch with a point which the Directors always strove after—that was, a reduction in the price of gas. The Company had been celebrated in years gone by for the extremely low prices at which they sold gas in Hull; but they had been somewhat thwarted in their endeavours to bring about the same happy result in Norwich, owing to their having to reconstruct the works there, which had been the cause of their spending a large sum of money which had to be written off for wear and tear. This had militated against the reduction in the price of gas at Norwich to the figure at which the Directors would have liked to see it. However, he believed that they were now in a position to announce to the citizens that, from Christmas next, they would be able to make them a reduction of 3d. per 1000 cubic feet. He also hoped, when the Board had an interview with their local Manager at the Potteries (who was coming to town for the purpose in a few days' time), they would also be able to make some reduction at that station. This would benefit the Company and the consumers, and tend to increase the popularity of the British Gaslight Company.

Mr. FREDERICK WILKIN seconded the motion, which was unanimously carried.

Proposed by the CHAIRMAN, and seconded by General W. T. CORRIE, a dividend of 20s. per share for the half year was unanimously declared.

Moved by Mr. CORBET WOODALL, and seconded by Mr. WILKIN, the Chairman was re-elected to his seat at the Board; and the similar confidence was continued in Mr. Wilkin by his return, on the motion of the CHAIRMAN, seconded by General CORRIE.

On the proposition of Mr. H. G. LONGDON, seconded by Mr. KENNETH R. MACKAY, Mr. E. Yardley, one of the Auditors, was re-appointed, as was also his colleague—Mr. E. Knowles Corrie—on the proposition of Mr. L. ABBEY WILLIAMS, seconded by Mr. H. G. LONGDON.

The services of the Chairman and Directors were acknowledged, on the motion of Mr. MACKAY, seconded by Mr. E. W. LINGING.

The CHAIRMAN having duly acknowledged the vote,

Mr. R. S. GARDINER said their successful operations were largely due to the fact that they had the good fortune to possess an exceptionally able and devoted staff. In their Secretary (Mr. Brookes) they had an officer who was singularly capable in mastering the somewhat intricate details connected with the accounts of the Company—involved as they were between the parent Company and the accounts at the different stations, with the directions of the numerous Acts of Parliament by which they were governed. It was also reassuring to know that Mr. Brookes had sufficient confidence in the Company to now embark upon matrimony; and they offered him that day their best wishes for his future happiness. With regard to the stations, there again, they were singularly fortunate. At Hull, they had in Mr. Young an Engineer whose name was familiar as a contributor of instructive literature to the technical associations, and the merits of their Engineer at Norwich were so well appreciated that he now occupied the position of President of the Institution of Gas Engineers, and so on with their other officers. Under these circumstances, he (Mr. Gardiner) had peculiar pleasure in asking the shareholders to support most cordially the resolution he had to submit, that their best thanks be given to the officers and staffs.

General CORRIE seconded the motion, which was unanimously carried.

Mr. BROOKES, in acknowledgment, said he was sure the feelings of the several Engineers would be in accord with his own, and that the resolution would be regarded by them all with much gratification, and

would encourage to further efforts. With reference to the personal good wishes, he felt at a loss to express his feelings of gratitude, but he asked the Directors and shareholders to accept his heartfelt thanks.

This concluded the proceedings.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Wednesday—Alderman W. F. COTTON, D.L., J.P., in the chair.

The SECRETARY AND MANAGER (Mr. Francis T. Cotton) having read the notice convening the meeting, the report and accounts for the six months ending the 30th of June, some particulars from which were given last week, were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, expressed his regret at having to state that in one or two respects the latter were disappointing, especially in the sale of gas; for there had been a falling-off to the extent of 21½ million cubic feet in the past half year compared with the corresponding period of 1907. This reduced sale might, in some respects, be attributed to the extraordinary condition of the atmosphere in the period under review, more particularly during the clear, bright weather experienced over the last three months of the half year. There had also been a further substitution of incandescent for the old-fashioned flat-flame burners. The use of the former, as the proprietors were aware, led to considerable economy in the consumption of gas. But there was another and a more serious cause to which he must call attention. The unfortunate strike which occurred in the works a few days before Christmas extended into and through the month of January, leaving the Company short of gas for weeks during the darkest days of the year. The new hands they found it necessary to employ had to be trained to retort-house work. He need hardly say this took some weeks to accomplish; and meanwhile the production of gas was considerably curtailed—the yield from the coal carbonized being on some occasions only about half the usual quantity. The Directors experienced a most anxious and troublesome half year, commencing with the strike, when some of the oldest hands in the Company's service left their work at a moment's notice, regardless of the consequence and the risk of plunging the city into darkness. From the loss of coals and gas, and the cost of catering for the new hands—it being found necessary to board and lodge them on the Company's works—the Directors calculated that the loss sustained amounted to at least £10,000. However, owing to the great care and exertions on the part of the officers, they considered that they came out of it very well. The last strike which took place in one of the gas-works in London cost £72,000. Coming back to the accounts, the revenue received for gas and meter-rents amounted to £135,281—being an increase of £4647 over the corresponding period of last year; and for residual products £20,232, or an increase of £4257. Then there had been a saving in wages and other items of £1956, which, added to the increase just mentioned, made a total of £10,860, against an additional expenditure on coals, oils, &c., of £15,054. Coal and oil cost £62,013, against £51,200 in the corresponding half of last year; being an increase of £10,813. Under the head of "Repairs and maintenance of works and plant," there was an increase of £881, mainly due to the rebuilding of the retort-houses at the Great Brunswick Street station. It was intended that these houses should be fitted with modern appliances for the manufacture of gas on the most economical principles. They had lately disposed of a large quantity of tar, at a very low price, for the purpose of road making; being anxious that the local authorities might have an opportunity of experimenting with it. But up to the present time some of the experiments had been carried out in a manner calculated to prejudice pedestrians and carriage owners against its use. In his opinion, it would be a great advantage to local authorities to employ some person experienced in the making of tar roads, if only for a few months, to get the benefit of his experience. He had been in many places in England and on the Continent where excellent roads had been constructed with tar. They were extending their mains to Foxrock and Carrickmines (two districts which were rapidly growing in population), and were also laying an additional main to Rathmines, Rathgar, and the adjacent districts, to meet the increased demand for gas, which was growing very fast indeed, more particularly for cooking and heating purposes, which was a branch of business that was largely on the increase. During the half year there had been erected 1562 new installations, in each case fitted with cooker, brackets, and pendant. There were also 135 cookers supplied without house fittings; 223 cookers and 94 heating-stoves let on hire; and 19 cookers, 66 heating-stoves, and 35 gas-fires purchased by consumers. The Directors hoped that before long they might be in a position to announce a reduction in the price of gas. He was firmly confident that coals could not much longer maintain their present high rates; and, of course, the price of gas depended in a great measure on the state of the coal markets, which he was glad to say were showing some signs of a downward tendency. In the current half year there were some slight reductions, but not to the extent that would warrant any lowering of the price of gas. The result of the half-year's working was that, after providing for interest on the debenture stock and overdrafts from the bankers, there remained a balance of £28,387 to be carried to the profit and loss account. To this was to be added £195 brought forward. The Directors recommended the payment of dividends at the rates of 10 and 7 per cent. per annum on the respective shares. To do this it would be necessary to have recourse to the reserve fund, and draw therefrom £6424. A similar course to this had been adopted on many previous occasions, when coals reached such abnormally high figures that the profits were not sufficient to pay the ordinary dividends. In conclusion, he had to inform the proprietors that the Directors felt the time was at hand when it would be desirable to issue additional capital in order to clear off the debit at their bankers.

Mr. C. LAWLER seconded the motion, and it was carried.

The dividends recommended having been declared, a vote of thanks was accorded to the Chairman, Directors, Secretary, and officers of the Company.

The CHAIRMAN, in acknowledging the vote, said his colleagues and he would leave nothing undone for the benefit of the undertaking. They had had a very trying time lately; but they had gone through similar difficulties before, especially as regarded their profits. On the return of prosperity, however, they had recovered their position.

Mr. F. T. COTTON replied for the officers, and the proceedings terminated.

EDINBURGH AND LEITH GAS-WORKS.

Visit of Inspection to Granton.

On the afternoon of Thursday last, the Edinburgh and Leith Gas Commissioners paid a visit of inspection to the gas-works at Granton. The inspection being intended for an educative purpose, the members of the Town Councils of Edinburgh and Leith who are not members of the Gas Commission were also invited. There was not a hearty response to the invitation.

On their arrival at the gas-works, the visitors were received in the Technical Office by Bailie Inches, the Convener of the Finance and Law Committee, and Mr. W. R. Herring, the Engineer. Luncheon was served in the same apartment, Provost MACKIE, of Leith, in the chair, with Bailie BRYSON, of Leith, the Convener of the Works Committee, and Bailie INCHES as Croupiers.

Treasurer HARRISON, of Edinburgh, proposed the toast of "The Gas Commission." He said he should like to begin by saying that, on the whole, he was rather an electric light man than a gas man. He was sorry to say that he could not get any money out of the Gas Commission. They spent all their money upon themselves, or else upon the people who burned gas; and that did not suit him, from the Treasurer's point of view. When he was in want of a few thousand pounds, he could always pick the pockets of the Electric Light Convener, who, so far as he could make out, seemed to enjoy the operation just as much as he did himself. All he had to say about the Gas Commission and their works was to express his great admiration for the ability with which the Commission and their officers faced up to the situation when the electric light was introduced. It seemed then the electric light was going to sweep everything before it. But the Gas Commission found out the trade they were able to do—new branches in which they could extend their operations; they set themselves to the trade which was before them with their whole heart; and they had succeeded as nobody could have believed they would. They were successfully carrying on a great business in Edinburgh and Leith; and he very warmly congratulated them upon the way in which they had conducted it in late years. He congratulated them very sincerely upon the really noble structures they had put up for making gas. He knew upon high authority that the Edinburgh and Leith gas-works were among the finest, if not the very finest, in the United Kingdom; and it was a pleasure to him to propose success to an industry which did not need any praise—for its operations spoke for it.

Bailie BRYSON, in responding, said that since the works were first put into operation, on Oct. 21, 1902, the quantity of coal which had been converted into gas had been 1,015,833 tons. In the same period the economies in the cost of manufacture had amounted to £246,540, as compared with what it would have cost had operations continued at the old works. Of the sum he had mentioned, £180,724 was attributable to the general design of the works and the mechanical arrangements employed for saving labour; £21,876 was due to a greater yield of gas being obtained from the coal used; and £43,940 was due to economies in the fuel employed for heating with modern furnaces. The wages of the employees had also been increased. Since 1900 the average increase amounted to rather more than 12 per cent.

Bailie INCHES also acknowledged the toast, saying that financially the position of the gas undertaking was on a very sound footing. Not only were the Commissioners contributing the full statutory sums towards the sinking fund for the liquidation of the capital, but they were also setting aside additional sums—£10,000 in the current year, and it was hoped a larger sum in the coming year—to a special depreciation fund. This was apart altogether from spending on an average £40,000 per annum on the repair and upkeep of the plant and undertaking. The change in the requirements of the gas consumers had prompted the Commissioners to obtain parliamentary sanction to a radical change in their method of operating at the works. It was hoped that full sanction would be obtained for these proposals in the near future; and when they were in force, they would result in a saving in the cost of manufacturing charges of £35,000 per annum. When the Gas Commissioners had such powers, gas consumers would be entitled to a very substantial reduction in the price of gas, and the gas supply would be better suited and more economical for the purposes for which it was now primarily used by the public. The interest of the Gas Commissioners was the interest of the consumers. Their great aim was to supply gas at the lowest possible price; and if they had not been opposed, he believed that this year the Commissioners would have been able to sell gas at 2d. per 1000 cubic feet less than they were doing.

Bailie MAXTON proposed "The Officials of the Gas Commission." A great deal of the success of the gas undertaking, he said, was due to the zeal, the energy, and the ability of the officials. They had the veteran Mr. Cockburn, who collected their money in a most admirable way; they had Mr. Gibb, the Treasurer, who stored it for them to the best advantage; and they had Mr. Herring, who saw that the gas was properly made. The results attained by such a combination of efficient officials had been in all respects most satisfactory.

Mr. W. R. HERRING, the Engineer, on behalf of his colleagues and himself, thanked Bailie Maxton for his kindly words, and the company for the hearty manner in which they had responded to them. He could assure them that the officials appreciated these little marks of recognition; but whether or not, he could further assure them that the officials had but one object, which was to serve the Commissioners faithfully and well. They were in perhaps a somewhat unique position as regarded officials of a trading concern, which was one of the points the Treasurer of the City referred to. Ordinarily a municipal undertaking was carried on for the benefit of the municipality. It was a common practice, probably more so in England than in Scotland, that

profits from municipal undertakings should be taken in hand by the city treasurer, and administered for the common weal. In the case of the Gas Commissioners, he did not know that he should mention the word, but they were a purely co-operative undertaking. The concern was the property of the gas consumers; and it was wholly and solely worked for their benefit. Any profits arising in any one year from the proceeds of manufacture had to be considered and taken into account when fixing the price of gas for the succeeding year; so they could see that any economies which could be brought about were for the direct benefit of the consumers. At the present day the community were not all consumers of gas. There were some who used electric light, the profits from which were applied for the benefit of the whole community, and to a certain extent helped to relieve the rates of gas consumers as well as of the gas undertaking. Speaking generally, from what he considered a sound financial point of view, he thought that where a municipality engaged in a trading concern, it should be on the basis on which the Gas Commissioners carried on their work—whatever was done by them was for the benefit of those who used the product. As far as the Commissioners were concerned, he could assure them that they had but one object—that was to serve the consumers to the best of their ability; giving them the product they produced at the cheapest possible cost.

The party then went through the works; Mr. Herring acting as guide and explaining the operation of each part of the plant. In the end of the engineering shop a canteen has been fitted up for the use of the workmen, in which breakfast and dinner can be served, and in which the men can spend the meal hour in smoking and reading; newspapers being supplied by the management. There are about 700 men employed in the Granton works, about 400 of whom are carried by train daily between the works and Edinburgh free of charge. The distance being too great for them to go home for meals, this provision has been made for them inside the works. Accommodation has been fitted up for dealing with nearly 300 at one time. The Commissioners have done all the work, have fitted up cooking appliances—gas heated—of the most approved pattern, and have furnished all the utensils, crockery, and cutlery. The cooking is attended to by two chefs from the mercantile marine; and the waiting is entrusted to youths employed in the works. The purveying is attended to by a committee of workmen. The very low charges have been fixed of 3½d. or 6½d. for breakfast, according to order, and 5d. for dinner, the viands for which vary from day to day. It was stated that the canteen had been in existence for about two months, and it had proved a great success; the workmen much appreciating the comfort and convenience of it. The Commissioners provide the gas for cooking free of charge; and it is calculated that the cost of the service they render to the workmen is about 4d. per man per week. A very slight profit is made upon the food sold, which is applied in the keeping up of the utensils and movables. The last item inspected was the photometer—a 60-inch "Standard" Letheby and bunsen instrument, exactly similar to the one which the Corporation of Edinburgh have had fitted up in the City Chambers for the testing of the gas sent into the city from Granton. The working of the apparatus was explained by Mr. Herring, and was of much interest to the councillors, who, from the explanations given, derived much, to them, new and useful information with regard to the bearing of legislation upon light. At the close of the inspection tea was served, and the party broke up.

EXPLOSION AND FIRE AT THE WALKER GAS-WORKS.

Early on Saturday afternoon, there was an explosion of gas, followed by an outbreak of fire, at the Walker works of the Walker and Wallsend Union Gas Company. Three men were seriously injured; and the house in which the explosion took place was burnt down. It is explained that there are at the works two gasholders—one small and the other large. Between these holders is a meter-house, containing a gas-engine used in transferring gas from one holder to the other. The engine had just started to pump gas from the small holder to the large one, when there was a loud explosion. The place instantly burst into flames; and James Patterson, foreman of the works, and John Page, engine man, who were in the meter-house at the time, were badly burned about the upper part of their bodies. Frederick Stephenson, a fitter, who was engaged repairing boilers, rushed to their assistance; and he also was seriously burned. The three men were speedily conveyed to Walker Hospital. In the meantime, the fire brigade from Headlam Street was summoned, and was quickly on the scene. The fire was promptly got under; but not before the house had been completely destroyed. The flames were, however, prevented from spreading to adjoining buildings.

Suicides by Gas.—The Manchester Coroner last Friday inquired into the circumstances attending the fourth suicide by gas poisoning that had taken place in the city within ten days. A woman named Amy Croft, aged 28, who had been suffering from a nervous complaint, had, during the absence from home of her parents, put her head inside a gas-oven, turned on the tap, and placed a cloth over the stove. A Darlington signalman has also killed himself by the aid of gas. He was found in bed with the gas turned on in the room. Sheets had been placed over the windows and door, in order to prevent the gas from escaping.

Swansea Corporation and their Engineer.—The Water and Sewers Committee of the Swansea Corporation held a meeting on Monday of last week to consider a recommendation of a Sub-Committee that the Borough Engineer (Mr. R. H. Wyrill) be asked to resign. The Sub-Committee had been instructed to inquire into complaints made that the Engineer had undertaken private work without the authority or knowledge of the Water Committee, and into alleged unreasonable delays in carrying out drainage works which were attributed to dilatory preparation of the necessary plans. The Committee thoroughly discussed the whole matter; and in the end the view prevailed (by 9 votes to 6) that the action recommended was too drastic, having regard to the long connection of Mr. Wyrill with the town, and the value of his services as Water Engineer.

MUNICIPAL COAL SUPPLY QUESTION AT BRADFORD.

At the Meeting of the Bradford City Council last Tuesday—the Lord Mayor (Mr. J. E. Fawcett) in the chair—the question of adopting a scheme of municipal coal supply was under consideration. A motion on the subject stood on the *agenda* in the name of Alderman Hartley; but, in his enforced absence from the meeting on account of ill-health, he had entrusted it to another member of the Council.

Mr. A. T. Priestman moved the resolution, as follows: "That a Committee of ten members of the Council be appointed to consider and report upon (1) the best method of supplying coal to the citizens from the gas-works or a special depôt, and (2) the proper way to obtain parliamentary powers for obtaining a colliery or collieries for the use of the city." He observed that Alderman Hartley had given notice of a resolution extremely mild, considering the position of the coal trade. So mild was it, that he understood there would be a friendly amendment. The coal trade had become a practical monopoly, and prices were not really fixed by competition, but by a ring of large coal owners. It was, therefore, opportune to find out the best method of dealing with the business themselves as a Council. There was no doubt that a municipal coal supply might save the ratepayers a large amount of money; and every penny saved upon coal was just as good to them as if it were taken off the rates. It might be said that they were not competent to manage a coal business; but he contended that the trade was certainly more simple than the management of gas, water, and electricity works, all of which required the laying of pipes or cables in the streets.

Mr. Leach having seconded the motion,

Mr. Glyde moved, as an amendment—"That this Council instructs the Parliamentary Sub-Committee to include in the next Parliamentary Bill a clause giving power to the Corporation to carry out a municipal coal supply."

The Lord Mayor said he could not accept the amendment; and, after some remarks, it was ruled out of order.

Alderman Hayhurst then moved, as an amendment—"That the Parliamentary Committee be instructed to consider and report upon the best method of supplying coal to the citizens from the gas-works or a special depôt; and that such Committee be instructed to make their report in time for the inclusion of the matter in the next Parliamentary Bill." He said that some years ago, on the eve of the municipal elections, the Council decided by resolution to take steps to secure powers for the acquisition of a colliery. But in order that it might be inserted in a Bill, it was necessary that a clear majority of the Council should be present and take part in the voting. When the statutory confirmatory resolution was brought forward, there were not sufficient members present to make it legal to include the proposal in the Bill.

Mr. Glyde, in seconding the amendment, said that possibly if a poll of the citizens were taken with regard to this matter, nine-tenths of them, with the exception of a few middlemen, would be found to be in favour of a municipal coal supply. A week previously the Gas Committee placed contracts for 181,000 tons of coal; and this, of course, could be obtained at a considerably less rate than a manufacturer would pay for (say) 5000 tons. This would be one step in the direction of breaking down the great coal monopoly of the country. There was a tremendous ring at work; and no doubt the extraordinary prices paid for coal by the small consumers and the manufacturers had contributed towards the present depression in trade. During recent years the price of coal had risen as much as 4s. a ton, with practically no protest or murmur against it. The only remedy for such a state of things was a municipal coal supply.

Alderman H. B. Priestman said that the amendment would commit the Council to providing a supply of coal to the citizens from the gas-works in some way or other, upon which the Committee would have to report. He should not have so much objection if the Committee were appointed to consider the whole question, take evidence upon it, and really get at the bottom of the case, for there had not been sufficient proof that any saving would accrue from such a change. The amendment tied the Council down not to consider the subject as a whole, but as if the only question was one of method. He should prefer an amendment which would give the Council a free hand; and he gave notice of his intention to move one which would be aimed at the possibility of meeting what was admittedly a burdensome and oppressive ring in the coal trade.

The amendment was then put and lost by 39 votes to 13.

Alderman Priestman then proceeded to move his amendment, which was to the effect that a Committee of ten members of the Council, representing the three parties proportionately, should be appointed to consider the advisability or otherwise of supplying coal to the citizens from the gas-works or a special depôt, and obtaining parliamentary power for the purpose of having a colliery or collieries for the use of the city. This amendment, he urged, left the question an entirely open one. By it the Committee were asked to satisfy themselves as to whether or not any change could be made. He thought all would agree in the desire that there should be a possibility for the poorest citizens in Bradford to purchase coal at a reasonable rate, and that if there were any methods which could rightly be adopted towards this end, without wandering into the area of unwarrantable speculation, they might consider them. He had a shrewd suspicion that it would be difficult to prove that coal could be obtained cheaper for the people by the proposed scheme. There seemed to be an idea that to be in the coal trade was to be a possible millionaire. But while he believed those who were in the wholesale trade had made large profits, he was told that the dealers in house fuel had had an extremely bad time of it. It was said that 12 per cent. of the sales went in bad debts, and that the cost of collecting accounts was very high. Were the Council prepared to become a prosecuting power for bad debts—taking up an attitude which, he thought, most of them would shrink from? These matters, with the question of the ring in the coal trade, ought to be thrashed out by a Committee who could have the facts of the case before them, and could then decide upon a wise and prudent course in the circumstances.

Mr. E. J. Smith, in seconding the amendment, urged that, without

inquiring into the wisdom or otherwise of the step, to propose municipalization of an industry was scarcely based on commonsense or sound judgment. He was opposed to the monopoly which he was certain existed in the coal trade, as it was one of plunder, which all right-thinking men ought to resent. There was no justification for the abnormal advances in price which had taken place; and trade was being crippled. But while properly expressing their resentment, and seeking ways and means to avoid this abuse of power, they must at least take the necessary precautions to ascertain whether they were able to exercise, in the public interest, the power proposed; and this was the chief reason why Alderman Priestman's amendment should receive the fullest consideration.

Mr. J. H. PALIN declared that Alderman Priestman's amendment would shelve the matter indefinitely. There could be no other object in view; for the *pros* and *cons* of the question had been considered for years, and the members of the Council were well acquainted with the arguments. Personally, he was in favour of every inquiry being made. At the same time he wanted something practical to be done; and he believed the question was now ripe, and waiting for solution.

Mr. LEACH said he could not understand Alderman Priestman's fears. With Parliament constituted as it was, he might have saved himself the trouble of bringing forward all these arguments, and posed as a friend of a municipal coal supply quite safely.

Alderman PRIESTMAN said it would have been infinitely easier for him to sit still and merely vote against the resolution. What he was attempting to do was to get at the facts of the case, and see whether anything could really be done. He was honest in his attempt, and was prepared to sit on the Committee the necessary number of hours to do the work. There was still time to report for the Parliamentary Bill.

Mr. A. T. PRIESTMAN said the difference between the resolution and the amendment was perfectly clear. The mover of the amendment merely wanted to have a roving commission to see what difficulties he could raise.

The amendment was then put and negatived by 37 votes to 15.

CONGLETON AND THE BIDDULPH GAS SUPPLY.

A Transfer Bill to be Promoted.

At the Meeting of the Congleton Town Council on Monday last week, the Gas Committee reported that the Town Clerk (Mr. E. A. Plant) had submitted a Draft Bill with respect to the proposed supply of gas to Biddulph, and after some discussion it was resolved that the matter should be proceeded with, and that a Sub-Committee should be appointed to act in conjunction with the Town Clerk and the Gas Manager (Mr. J. Smith) in the framing of the Bill, conducting negotiations with the Biddulph Gas Company, and other matters connected with the proposed scheme. The adoption of the minutes of the Committee having been proposed, Mr. Hall asked when there would be an opportunity of the matter coming before the public. The Town Clerk replied that the Bill would be delivered about the end of November, and a meeting could be called after that. Mr. Hall said he was strongly of opinion that the matter had hardly had sufficient time for full investigation. He added that he had great respect for what the Gas Manager had done in connection with the matter; but he was prepared to move, as an amendment—"That the minutes be referred back, and that the matter remain adjourned, to enable the Council to communicate further with Biddulph, with the view of finding out whether they could come to terms to buy out Biddulph at a satisfactory price." The Mayor (Alderman Solly) said negotiations had been entered into, and it was his opinion that Biddulph would get a better price for their works by agreement than if they pushed Congleton to fight the matter. He thought Mr. Smith's figures had been well prepared and did him great credit. If the scheme were carried out, they would extend their works and be enabled to employ a few more Congleton men. Though it had been mentioned outside the Council that the project would mean 2d. in the pound on the rates for the first year or two, he (the Mayor) was satisfied that there would not be a farthing additional charge. On a vote being taken, the amendment was lost, and the Committee's minutes were adopted.

STOURBRIDGE WATER SUPPLY.

Proposed Management of the Works by a Joint Board.

A Special Meeting of the Stourbridge Urban District Council was held on Monday last week, under the presidency of Mr. W. R. Selleck, to receive a report from the Council's Consulting Engineer (Mr. W. Fiddian) upon the present position of affairs in regard to the proposed acquisition of the undertaking of the Stourbridge Water Company by a Joint Board composed of neighbouring local authorities. The report was taken in committee; and upon resuming, Mr. Henry King proposed —"That this Council apply in the next session of Parliament for an Act to constitute and incorporate a Joint Water Board, consisting of representatives of this Council and two or more of the following Local Authorities—viz., the Urban District Councils of Amblecote and Lye and Wollescote and the Rural District Councils of Bromsgrove and Kingswinford—and to transfer to, and vest in, such Board the undertaking of the Stourbridge Water Company, Limited, and for other purposes; and that the expense be defrayed in the first place out of the general district rates, and ultimately out of money to be borrowed under the provision of the Act." The Chairman, in seconding the motion, said he was very pleased the proposal to acquire the water-works had aroused a very small amount of criticism. Opposition to the Council's proposals from a certain number of ratepayers was to be expected, because there were many people who were opposed to the principle of the acquisition of such undertakings by municipalities. The Council did not fear investigation of their figures by any competent accountant; and the terms of the purchase of the works were much more favourable to them than were those of the gas-works. The resolution was carried.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I take note first, this week, of the visit of the Town Councils of Edinburgh and Leith to the Granton Gas-Works on Thursday, a report of which appears on p. 65. It was appropriate that, at a time when, according to Bailie Inches, "the change in the requirements of gas consumers has prompted the Gas Commissioners to obtain parliamentary sanction to a radical change in their method of operating at the works," the Commissioners should endeavour to extend a knowledge of their methods among the members of the Town Councils. It is peculiarly appropriate, in view of the fact that Councillors will, within the next month, have to face the ratepayers at meetings in connection with the municipal elections, that when questions may be asked bearing on the gas undertaking means should be taken to ensure that intelligent answers be given. The Commissioners had experience in the end of July, in the course of the parliamentary inquiry into their Provisional Order, of how, in the minds of some, very hazy notions may, in the absence of fuller knowledge, crystallize into conviction, and give rise to trouble, besides entailing enormous expense. It is not ascertainable whether or not we have heard the last from this quarter, or whether the ring who were responsible for the opposition then may not endeavour to cover their defeat by something not yet disclosed. But, at all events, it is wise on the part of the Gas Commissioners to endeavour to cut away any possible support which the leaders of the discontented faction might seek to obtain among their fellow-councillors. From this point of view, the visit of inspection was quite justified. The pity is that it was not more fully taken advantage of. Among the absentees were those who led the opposition at the parliamentary inquiry; and there were probably some who stayed away because of the fear of being asked about the luncheon that was served. As to the first class, it is, perhaps, not uncharitable to say that they held themselves to be beyond the stage of enlightenment, and did not wish to be informed of what they knew would not be to their liking. The Granton Gas-Works are quite well known to readers of the "JOURNAL," and need no commendation. Their condition of tidiness was simply perfect; but that is their ordinary condition, and need not be enlarged upon. As regards the works and plant, there was little new to show; but the councillors were interested in the latest development in works management, in the shape of the establishment of a canteen for the workmen. The only item of new plant shown to the visitors was the Letheby-Bunsen photometer. Such an instrument had never been seen by some of the councillors, and to such it was a revelation to find that so much care is daily bestowed upon the testing of the gas. One of the councillors summed up the situation in the remark that within a few minutes he had learned more about lighting than he had in all his lifetime. A result such as this compels the verdict that the visit of inspection was a pronounced success.

On Monday, the Commissioners held their usual monthly meeting—Bailie Inches in the chair. In the minutes of the Works Committee, the visit of inspection to Granton, with which I have just dealt, came up as a recommendation. Bailie Douglas moved that the inspection should not take place; but the motion was not seconded. The Chairman pointed out that it was two years since the Corporations had been at the works, since when there had been considerable alterations and improvements. Bailie Maxton thought a visit to the works would be an education to most of them. He observed that the Works Committee recommended that the price of gas should be fixed at 3s. per 1000 cubic feet. Could it not be reduced to 2s. 10d.? Mr. Herring explained that had the Commissioners been reasonably assured of their Bill going through without opposition he would have suggested a reduction of 2d. per 1000 cubic feet for this year. But the Bill had been opposed; and it had still to go through many processes before it became law. He did not feel justified in anticipating what the result might be. Therefore it was necessary to keep the price at 3s. If, however, the Bill should become law as it left the Parliamentary Committee, the Commissioners would be able to make an immediate reduction of 2d., which would be equal to £16,000 on the year's gas consumption. This, replied Bailie Maxton, meant that the opposition of the Corporation of Edinburgh had cost the citizens £16,000. The price of gas was accordingly, in the meantime, retained at 3s.

In the minutes of the Glasgow Corporation Gas Committee, submitted to the Town Council this week, it was stated that the Committee had had before them a letter from the Secretary of the Cambuslang Gas Company, Limited, calling attention to the action of the Corporation Gas Department in supplying with gas certain tenements in the Eastfield district, the occupiers of which were till recently customers of the Company. The Gas Engineer reported to the Committee that the tenements referred to are within the Corporation's gas supply area; that their gas-mains run close to the tenements; and that, in the circumstances, the Gas Department, who had been applied to for a supply by the occupiers, had no alternative but to give it. The Committee instructed the Town Clerk to write to the Cambuslang Company in accordance with the Engineer's report.

In the Elgin Town Council on Monday, Treasurer M'Caskie presented the Corporation accounts for the year. Dealing with the gas accounts, he said they had turned out more favourably than estimated; and it was therefore proposed not to make any alteration in the price of gas. During the year the new gasholder had been in course of erection, and towards meeting the cost of it they had borrowed £3000. It was reported that the Auditor had approved of the burgh accounts, subject to the remark that the reserve to meet bad debts on the amount outstanding for gas was inadequate.

Gas matters at Sanquhar do not go very smoothly. The other day the Town Council found fault with Mr. Laidlaw, the Convener of the Gas Committee, for having employed a labourer to assist the Gas Manager, and also for his action in connection with the erection of a boundary wall at the gas-works, which a neighbouring proprietor considered to be an encroachment upon his property. The wall is to be taken down and rebuilt. These incidents have so affected Mr. Laidlaw that he has written to the Town Clerk resigning his membership of the Council.

The Town Council of Ellon on Thursday last, it is reported, had

considerable discussion over the accounts of their gas undertaking. It is four years since the transfer took place; and during that time, to use an expression employed in the Council, the works have "dropped money" to the ratepayers. The discussion was upon the question of whether or not a gas contingent rate should be levied. The Council agreed to impose a rate of ¾d. in the pound upon occupiers, and to charge £10 extra against street lighting.

In his annual report regarding the oversight of weights and measures in Aberdeen, Mr. Andrew Thyte, the Chief Inspector, states that the number of gas-meters tested during the year was 978; and the fees amounted to £28 19s. 9d. Of the meters, 894 were tested for the Corporation gas-works, after repairs; and of these 13 were found to be not in accordance with the Sales of Gas Act, and were not stamped, but were returned to the works for readjustment. The remaining 84 were tested for consumers; and 23 of them were found correct. The other 61, not being in conformity with the Act, were certified as such, and, consequently, returned to the gas-works; the fees for the same being charged against that department. Of the 74 incorrect meters, 64 were fast, two slow, three would not work, three were passing gas unregistered, and two were leaking. The percentage of error ranged from 23 per cent. fast to 5·66 per cent. slow.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *Oct.* 3.

There was a slightly better tone in the market at the beginning of the week, and a fair business was done, supplies having moved off freely. A quieter feeling has, however, prevailed since, prompt requirements having apparently been satisfied; and at the close values show little variation from last week. There has been a good demand for delivery at Leith, where the higher prices have been obtainable. Quotations to-day may be put at £11 2s. 6d. f.o.b. Hull, £11 5s. f.o.b. Liverpool, and £11 7s. 6d. f.o.b. Leith. In forward delivery, no business is reported for January-June at makers' price of £11 17s. 6d.; but for delivery up to the end of the year, some few transactions have taken place at £11 8s. 9d. to £11 10s.

Nitrate of Soda.

Values are unchanged at 9s. 7½d. for ordinary, and 9s. 10½d. for refined quality.

Tar Products. LONDON, *Oct.* 5.

In pitch, the markets are very firm, and prices have been steadily improving throughout the past week; both in London and on the east and west coasts. On the Continent, there is certainly more inquiry, but buyers are not paying the increased figures asked by dealers. In South Wales, consumers appear to be well bought to the end of the year, and, in fact, to the end of March; but they would buy for April-December if they could secure supplies at a reasonable figure. Creosote is still firm, and ordinary London makes have been sold at 2¾d., prompt delivery; while for the best qualities, 2⅞d. to the end of June is asked. In the Midlands, 2⅝d. has been paid for prompt, also for delivery over next year; while in the North 2⅝d. is the figure. Benzol is unchanged at about 7d. to 7¼d. London, and 6¾d. in the North; and business has been freely done at both of these prices. In 5°-90 benzol, no advance is reported; but sales are stated to have been made in Paris over the next 12 months at equal to 6½d. England. Toluol is firm and in good demand for prompt delivery, and there is not very much offering. Solvent is steady both in London and the North, and there is a fair demand for same. Heavy naphtha is quiet, and there is not very much business doing at present. Naphthalene is depressed, and sales are difficult to negotiate. Salts are fairly steady, principally owing to the demand for creosote. Carbolic acid is very quiet, and sales have been made in England at 1s. 2d. delivered at consumers' works.

The average values during the week were: Tar, 12s. 3d. to 16s. 3d., *ex* works. Pitch, London, 21s. to 22s.; east coast, 20s. 6d. to 21s. 6d.; west coast, 20s. 6d. to 22s. f.a.s. Benzol, 90 per cent., casks included, London, 7d. to 7¼d.; North, 6¾d.; 50-90 per cent., casks included, London, 7¼d to 7½d.; North, 6⅝d. to 7d. Toluol, casks included, London, 8¼d. to 8⅜d.; North, 8d. to 8¼d. Crude naphtha, in bulk, London, 3¼d. to 3½d.; North, 3⅛d. to 3¼d.; solvent naphtha, casks included, London, 10¼d.; North, 9d. to 9¼d.; heavy naphtha, casks included, London, 10d. to 10½d.; North, 9d. to 9½d. Creosote, in bulk, London, 2¾d.; North, 2⅝d. to 2⅝d. Heavy oils, in bulk, 3d. to 3 1/16d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 2d. to 1s. 2½d.; west coast, 1s. 1¾d. to 1s. 2d. Naphthalene, £3 10s. to £7 10s; salts, 32s. 6d. to 35s., packages included and f.o.b. Anthracene, "A" quality, 1⅛d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article has been steady throughout the past week, and there has been no alteration in price. Figures are rather harder than at the commencement, and closed firmer. In London it is still possible to buy outside makes at £11 5s. on Beckton terms, but the principal Gas Companies quote £11 10s. to £11 15s. In Hull, one of the best makes has been sold at £11 5s. In Liverpool, £11 6s. 3d. to £11 7s. 6d. is about the figure; while in Leith nothing under £11 10s. is just at present being quoted.

An Unsound Gasholder at Barry.—At the meeting of the Gas and Water Committee of the Barry Urban District Council on Monday last week, the Manager (Mr. T. E. Franklin) stated that recently the top lift of one of the gasholders at the works had become unsafe, and about one-eighth of the contents, or 200,000 cubic feet of gas, had been lost before the escape could be prevented. The mishap was due solely to a faulty joint, which was exceedingly inaccessible for repairing purposes.

COAL TRADE REPORTS.

Northern Coal Trade.

There is now a languid feeling in the Northern coal trade, as far as the steam fuel branch is concerned; and the range of prices is lower, especially for forward delivery. Prompt prices for best Northumbrian steams are from about 13s. to 13s. 3d. per ton f.o.b., with lower figures when the delivery is at the latter end of the month. Second-class steams are 11s. to 11s. 6d., and steam smalls 5s. to 6s. In the gas coal trade, the production is better taken up; the local consumption now growing more rapidly. Durham gas coals vary in price from about 10s. to 11s. per ton f.o.b. for the usual qualities. More gas coal is now being sent to the Italian ports, where a fortnight or so ago there was some congested state of the lines that made a need for restricted shipments. There is little doing in the way of contracts at present; but for best gas coals the demand takes up the output largely on contracts now running. For coke, the request is fair. Gas coke is quoted relatively high, though there is an increasing production—good descriptions being from 16s. to 17s. per ton f.o.b.

Scotch Coal Trade.

Trade is dull, with little prospect of life in it. Foreign trade is rather going back; and the home trade is not improving. The prospect for the winter is a not very reassuring one for coalowners. The prices quoted are: Ell, 10s. 6d. to 12s. 3d. per ton f.o.b. Glasgow; splint, 11s. to 11s. 3d.; steam, 10s. 3d. to 10s. 6d. The shipments for the week amounted to 334,901 tons—a decrease of 532 tons upon the previous week, but an increase of 5675 tons upon the same week of last year. For the year to date, shipments have been 10,655,959 tons—a decrease upon the corresponding period of 310,174 tons.

Reduction in Price at Wallingford.—The Wallingford Town Council have accepted the recommendation of the Gas Committee that the price of gas shall be reduced from 4s. 6d. to 4s. 3d. per 1000 cubic feet. The revenue, in consequence of this decision, will suffer to the extent of £150.

Water Charges in the City.—It is stated that the Lord Mayor has acceded to the request contained in a requisition signed by nearly 500 of the most influential bankers, merchants, and others in the City to convene and preside over a public meeting to protest against the excessive charges under the new tariff of the Metropolitan Water Board. The meeting will be held at the Mansion House, at two p.m., on Wednesday, the 28th inst.

Sale of Shares.—At a local auction sale last week, some shares in the Eastbourne Gas Company were eagerly competed for. With the dividend accruing from June 30 last, two £10 original shares in the Company fetched £34 17s. 6d. each, four £34 15s., and four £34 10s. Four £10 "C" shares sold for £34 17s. 6d. each, fourteen at £34 15s., and four at £34 10s. Six £10 "B" shares were disposed of for £27 17s. 6d. each, six at £27 15s, and six at £27 10s.

Great Bentley Water Supply.—At the meeting of the Tendring Rural District Council last Wednesday, a letter was read from the Local Government Board in respect to the water supply at Great Bentley. It was stated therein that the Board observed from the new plans that the water-main which had been laid served a much smaller area than was intended to be supplied under the scheme submitted to them in 1906, which was itself inadequate to meet the needs of the village. The Board were satisfied that the whole village was in need of a proper supply, and that what had been done in the matter was altogether inadequate. They therefore urged the Council to reconsider the matter, with a view to the carrying out of the complete scheme. The Chairman remarked that he did not know of any house that had not a reasonable supply of water; and Dr. Cook said that he had not received a complaint from anyone unable to get water. Mr. Newman said it appeared that the Local Government Board were seeking to make them carry out an expensive scheme which was not required. No action was taken in the matter.

Proposed Merthyr and Cardiff Joint Water Scheme.—On the return of the deputation sent last week from the Merthyr Corporation to Cardiff to confer with representatives of the City Council upon the proposed partnership scheme for providing a new reservoir at Pontsticill, Mr. Sydney Simons, the Chairman of the Merthyr Water Committee, stated that the conference went thoroughly into the scheme, and found that the powers of the city representatives were the same as their own—viz., to report to their Water Committee. After going into the scheme together, the Merthyr representatives stated that it would be utterly impossible for their Council to agree in any way to promote a Bill this year. Whatever scheme was suggested would have to go before the ratepayers for full consideration. The city representatives seemed fairly favourably disposed towards the suggested scheme, and made it clear that, pending the decision of the City Water Committee, the Cardiff Water Bill would be proceeded with. If something definite was decided by March next, and a partnership agreed upon, the Cardiff Bill could be dropped, and the joint arrangement proceeded with.

The Trading Undertakings of Nottingham.—In his report on the Nottingham city accounts for the year ending March 31, Mr. Edward Harlow, the Mayor's Auditor, states that the total receipts on the general district rate account were £424,973, the amount of rate collected representing an assessable value of £1,065,540, as compared with £1,143,624, the assessable value according to the rate-books. In the Electricity Department the capital expenditure was £450,945, and the present net capital liability £361,091; the net trading profit being 12·66 per cent. In the Gas Department the capital expenditure was £1,146,006, and the present net capital liability £1,095,217; the trading profit being 9·75 per cent. For the tramways the capital expenditure was £608,602, and the net capital liability £501,581; the trading profit being 11·13 per cent. In the Water Department the capital expenditure was £1,180,152, and the net capital liability £1,136,173; the net trading profit being 8·34 per cent. The total capital employed in the trading undertakings of the Corporation was £3,094,062; and the combined profits were equivalent to a percentage of 9·8 per cent. on the capital employed, as compared with 8·81 for the previous year.

Development of Gas Supply in Adelaide.

When moving the adoption of the report and accounts for the year ending June 30, at the annual meeting in Adelaide of the South Australian Gas Company, the Chairman (Mr. A. M. Simpson) said the expenditure for the past year had been about £10,000 more than in the previous year. This had been almost entirely made up by the increased cost of coal and labour. The sales, however, had counterbalanced it. The quantity of gas sold had exceeded that of the previous year by 26 million cubic feet; while the demand for tar and coke had been such that the Company had been compelled to decline orders. The business done in the stove and fitting department, King William Street, had also been satisfactory; 50 per cent. more cooking-stoves having been sold than in the previous year, and treble the number that were sold in 1906. The Board realized that the large increase in the sale of these stoves had been chiefly owing to their cooking demonstrations; and they had resolved to repeat the experiment. The services of a lady had been engaged; and she would begin her duties almost immediately. The slot-meters fixed during the year had numbered 690, which made a total of 4100. Orders had been coming in so fast lately that the Directors had decided to temporarily stop canvassing. The continued increase in the demand for gas had made it necessary to take steps to increase the output of gas. Extensive additions to No. 4 retort-house at Brompton were well in hand; and an order had been placed for stoking machinery for the building. This machinery should soon be received. A large washer which had been ordered at the same time had arrived, and was being erected. Plans were being prepared for additional purifiers, a new governor-house at Brompton, and a large gasholder at Thebarton. At Port Adelaide, it was proposed to make additions to the retort-house and to erect a new gasholder. In spite of the dearer coal, the increased cost of labour, and keener competition, he thought they had reason to be satisfied with the year's business. The report was adopted.

Assessment of the Dowlais Gas-Works.—Mr. Rees Rees presided at a meeting of the Merthyr Union Assessment Committee on Sept. 26. Mr. D. W. Jones appeared on behalf of the Dowlais Gas Company to appeal for a reduction of the assessment, which is now fixed at £1100 rateable value. He said that during the year ended June 30 last the make of gas was 42,590,000 cubic feet, or 2,734,000 cubic feet less than in the preceding year. The price was 3s. 6d. per 1000 cubic feet, which was the maximum rate allowed by Act of Parliament. Owing to the preferential rate at which gas was formerly supplied to Messrs. Guest, Keen, and Nettlefolds having been altered by Act of Parliament, and the Company now being charged at the same rate as other consumers, instead of one-third of the total make being sent to the works, only one-sixth or one-seventh was now supplied. The consumption of gas by the Corporation in public lighting had been reduced by the replacement of 29 gas-lamps by electric lights. Mr. Jones added that the Company were prepared to allow the Committee's valuer to inspect the books, balance-sheets, and works. The appeal was adjourned to allow of this.

New Water-Works at Dartmouth.

The new works for supplementing the supply of water to Dartmouth were inaugurated last Wednesday, when the supply was formally turned on by Mrs. T. W. D. Napier, wife of the officer commanding the Royal Naval College. Members of the Corporation attended in state; and the heads of the Naval College and the borough officials were also present. The Town Clerk (Mr. S. J. Pope) stated that the works had cost £7819, which was a reasonable sum in comparison with what neighbouring communities had had to lay out to secure a supply of water. The Admiralty had supported the Council, and had entered into an agreement to take a considerable quantity of water for the supply of the College for a period of 21 years, and to pay a minimum sum of about £200 a year. He did not think the ratepayers would be seriously burdened by the cost of the works, but, on the contrary, hoped that the undertaking would in a few years be a source of profit. The Borough Surveyor (Mr. T. W. Joyce), the Engineer of the scheme, said the streams which formed the source of supply yielded an ample quantity of water for their purposes; and analysis showed that it was exceptionally pure. The water first entered an inlet-chamber, where any sediment was deposited. It was then turned into filter-beds, which were capable of filtering 110,000 gallons per day; and from these it flowed into a covered reservoir which would store 110,000 gallons. For distribution purposes, the water was then pumped to the Long Cross reservoir, situated at a point about 460 feet above the level of the other works. This reservoir was 130 feet above any of the other reservoirs, and was at a sufficient elevation to supply the higher point of the town and the Royal Naval College. It had a capacity of 300,000 gallons, and was divided into two compartments to facilitate cleaning. The pumps by which the Long Cross reservoir was supplied had a capacity of 10,000 gallons per hour. They were also able to turn a considerable quantity of water on to duplicate filters at Townstal Hill, and automatically pass this into the town mains, as occasion might require, by means of balance-valves—thus entirely avoiding pumping expenses. Mrs. Napier was presented by the Mayor (Mr. J. Brown) with a gold key, and turned on the water. The ceremony was followed by a luncheon. Messrs. Steer and Pearce, of Plymouth, were the Contractors for the new works.

A telegram, dated the 30th ult., in "The Times" last Thursday, announced the restriction of the water supply at Lisbon, owing to insufficiency of the quantity available.

Messrs. Joseph Taylor and Co., of Bolton, have received orders for their latest makes of solid plate-lead saturators for the Prescot, Longwood, Cockermouth, Windermere, Daventry, and Trowbridge Gas-Works, and also from Messrs. John Terry and Co., for export to Australia. In addition to this, the firm are supplying to the Mansfield Corporation the entire lead work in connection with a sulphate of ammonia plant saturator erected on lead-covered foundations, mother-liquor wells, draining table, sulphate stores, acid tank, catch-box, pipes and flanges, &c.

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A Deputation from Belfast.

The minutes of the Gas Committee submitted at the last meeting of the City Council contained the report of a deputation appointed to secure information in regard to (1) utilizing waste lime, (2) wet *versus* dry meters, and (3) automatic meters. The deputation visited Glasgow, Paisley, Edinburgh, Leeds, and London. In regard to the proposed extension of the gas-works, the Manager and City Surveyor had submitted particulars as to cost of the various sites; and they were instructed to report further regarding (1) Ormeau Park site, (2) ground offered by Mr. G. W. Ferguson near Adelaide Station, and (3) ground offered by Mr. T. E. M'Connell on Donegall Road. Mr. Tyrrell condemned the sending of the deputation as wasteful expenditure, and said all the information in the report could easily have been obtained by letter. Mr. M'Cusker said he objected in the first instance to the deputation; and now they had a sum of £135 charged as expenses. He moved that the Council express strong disapproval of the deputation as unnecessary and wasteful expenditure of public money. The Lord Mayor said he could hardly accept this amendment. The time to criticize was when they were appointing a deputation, and not when they came back. Mr. J. A. Doran (the Chairman of the Committee) said he was astonished at the statements made. The Corporation confirmed the appointment of the deputation last month. They left Belfast to the detriment of their own business, to look after the affairs of the Committee; and it was most unfair to make insinuations against them. The minutes were adopted.

Cirencester Gas Company, Limited.—At the annual general meeting of this Company last Wednesday, the Directors presented the report and accounts for the year ending the 30th of June. The total quantity of gas sold was 46,778,300 cubic feet, which was an increase of 630,000 cubic feet on the year 1906-7. This was regarded by the Directors as especially satisfactory, in view of the fact that both the electric light and acetylene gas were becoming competitors with coal gas for the lighting of private houses and business premises in the town. During the year, new purifiers were erected at the gas-works by Messrs. Willey and Co., of Exeter, under the superintendence of their Engineer and the Company's Manager (Mr. E. M. Beecham). They were stated to be working satisfactorily; and it was anticipated that they would effect considerable saving in labour. The balance shown on the revenue account was £2780, compared with £2901 this time last year. In spite of the considerable increase in the cost of coal, the decrease on the revenue balance was stated by the Directors to be only an apparent one, as the Company had 98 tons of coke and 6½ tons of sulphate of ammonia in stock beyond that in stock last year, which, if it had been sold, would have realized at least £130, and thus have brought up the balance to £2910. After allowing for interest on the debentures and the interim dividend, the balance was sufficient to pay dividends for the half year ending June 30 at the rates of £12, £6, and £8 8s. per cent. on the several classes of shares. This the Directors recommended; and it was agreed to.

Advance in Oldham Gas Workers' Wages.

At the meeting of the Oldham Gas Committee last Wednesday, the Deputy Town Clerk (Mr. Garside) read a letter from Mr. J. R. Clynes, M.P., to the effect that he was again instructed to ask the Committee to consider further the case of the men employed in the carbonizing department for an advance of 3d. per shift and a week's holiday each year with pay for men engaged in gas producing forty weeks in the year, and with a proportion of holidays for men engaged for not less than twenty weeks. The Chairman (Alderman Thompson) said the Committee had previously gone fully into the matter, and secured returns from towns using similar gas-producing machinery; and at that time they could not see their way to give the men the advance asked for, as they were as well paid as the men engaged in similar work in the majority of other towns. If Mr. Clynes or the men had any new information to place before the Committee, they would be willing to reconsider their claim. Mr. A. Andrews (the General Manager) added that Mr. Clynes said that he did not regard the question as disposed of. At a joint meeting of the Committees who employ day labour, a resolution was passed against the principle of giving holidays to men getting a daily wage and overtime pay. The effect of the resolution was sent to Mr. Clynes. Mr. Ashton moved that the men be given 3d. per shift; but Mr. Wilde said he did not think they were justified in doing so from the figures they had before them. The Chairman remarked that there was only one town using similar machinery which paid the men more wages than Oldham. It was ultimately decided to give the men 5s. 4d. per shift (8d. per hour), instead of 5s. 3d. per shift as at present.

West Gloucestershire Water Company.—The half-yearly general meeting of this Company was held on the 26th ult.—Mr. P. Fussell in the chair. In moving the adoption of the report, in which dividends at the rates of £4 and £2 16s. per cent. per annum on the 10 and 7 per cent. shares were recommended, the Chairman said the expenditure for the half year showed a decrease of £35 as compared with the previous six months, while the receipts were practically the same. The net profit, however, was about £40 less, mainly owing to the increase of interest on the overdraft at the bank. To meet this and the smaller balance brought forward, £50 additional had been withdrawn from the contingency fund. The increase in prospective revenue was very gratifying—the amount being £200 more than in either of the last two half years; but the effect was, of course, not felt in the period just closed. A sum of £3367 had been expended on capital account, chiefly on extending mains. Contracts had been placed for the construction of a suction-gas plant, engine, pumps, and receiving-tank for Old Sodbury. From July 18 to Aug. 25—just five weeks—no measurable rain fell in the Company's district. During this dry period the consumption of water increased 35 per cent. in comparison with all previous records; but it was met without strain upon the resources, though, of course, the coal bill went up. The report was adopted.

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NEW CATALOGUES, ETC.

The Wholesale Fittings Company, Limited, have prepared some striking show-cards referring to their "Ezol" inverted lamp, "Yotto" inverted burner and mantle, and "Bonbac" upright and inverted mantles. They are of a suitable size for displaying in show-rooms, and are of a nature well calculated to "catch the eye," and to imp ess on those who see them the claims of the goods they seek to extol.

We have received from the Richmond Gas Stove and Meter Company, Limited, of Warrington and London, a well-printed and nicely-arranged booklet entitled "Warmth in the Home." It is illustrated with half-a-dozen thumb-nail sketches, intended to appeal to the housewife—or her husband—who may contemplate using gas-fires. The booklet is to specially introduce a series of fires which meet the requirements of any rooms of a house. Full details are in the booklet of prices and sizes; and a page is devoted to showing the eight colours in "Porcellanite" enamel in which any of Richmond's gas-fires can be had. Thus it is quite easy to select a fire to harmonize with the colour scheme of the room in which it is to be fitted.

New Joint-Stock Company.—The East Wemyss and Buckhaven Gaslight Company, with its office in High Street, Kirkcaldy, was registered in Edinburgh last week. The capital is £5000, in £1 shares.

Proposed Provisional Order for Coventry.—The Gas Committee of the Coventry Town Council have decided to recommend that application be made to the Local Government Board for a Provisional Order under the Public Health Act, 1875, for altering and amending the Coventry Gas Act, 1856, the Coventry Corporation (Gas Purchase) Act, 1884, and the Coventry Corporation Gas Act, 1898, so as (1) to enable the Corporation to lay gas-mains in streets not dedicated to public use, (2) to enable the Corporation to inspect gas-fittings in new buildings, (3) to empower the Corporation to require consumers using gas-engines to employ an effective anti-fluctuator or other apparatus for controlling and regulating the supply of gas to such engines, (4) to provide that fittings let on hire by the Corporation shall not be subject to distress, and (5) to substitute improved methods of testing the illuminating power of the gas for those at present existing. The matter has been referred to the Gas Committee.

Interim dividends have been declared for the past half year of 16s. per share by the Anglo-Romano Gas Company; and at the rate of 7s. per share (equal to 7 per cent. per annum), free of income-tax, by the River Plate Gas Company.

The Burgess Hill Urban District Council have received an intimation from the Gas Company that from the 29th ult. the price of gas for public lighting would be 4s. per 1000 cubic feet. This is a reduction of 3d. per 1000 cubic feet on the price hitherto charged.

Complaints as to the absence of lighting in many of the public lamps in various parts have been made to the Tottenham Urban District Council. The Council are to write on the matter to the Gas Company, who are carrying out a system of automatic lighting in the district.

According to the "Daily Express," it was stated at the Tottenham Police Court last Thursday that the Urban District Council could not dispose of old street-lamps to dealers, and had accordingly buried them in order that men might not be tempted to steal them for the sake of the metal.

The Lighting Committee have been appointed by the Portadown Town Council to act as a deputation to the Gas Company, in order to ask the Directors to allow the Council a discount of 10 per cent. on gas consumed in the public lamps, and also to reduce the price to the consumers generally.

At the meeting of the Sheepbridge Coal and Iron Company in Sheffield on Monday last week, Sir Charles M'Laren expressed the opinion that the Mines (Eight-Hours) Bill, if passed, would certainly increase the working costs to some extent; and he estimated that it would be from 3d. to 6d. per ton.

A requisition signed by 500 of the leading citizens and ratepayers of the City has been presented to the Lord Mayor, inviting him to convene and preside over a public meeting to protest against the charges for water levied by the Metropolitan Water Board under the Act which came into operation on April 1 last, and to promote legislation at an early date for the reduction of those charges. The Lord Mayor, acceding to the request, has fixed the meeting for the 28th inst., at 2 p.m., at the Mansion House.

At the meeting of the Gas Committee of the Belfast Corporation on the 25th ult., the Engineer and Manager (Mr. R. Sharpe) reported on the subject of the tenders for gas cookers and fires, and it was resolved that those of the following firms should be accepted: The Richmond Gas Stove and Meter Company, Limited, Messrs. Arden Hill and Co., Messrs. John Wright and Co., Messrs. Fletcher, Russell, and Co., Messrs. R. & A. Main, Messrs. Wilsons and Mathiesons, and the Carron Iron Foundries. The tenders of Messrs. Thomas Glover and Co. and Messrs. Parkinson and W. & B. Cowan for dry meters were accepted.

In an article on the lock-out in the Lancashire cotton industry which appeared in the "Manchester Courier" last Thursday, it was stated that on the previous day there was a demand on 'Change for twofold yarns for the Far East, but that it could not be entertained "unless the strike clause was introduced into the contract." This was refused, with the hint that "the supplies required could be obtained from Germany, France, or Spain." Our contemporary says it is estimated that 25,000 colliers will continue to work short time owing to the lock-out, and that the supply and cost of house coal will be affected. Following on the announcement of a decrease of £10,000 in the takings of the Lancashire and Yorkshire Railway Company in the week ending the 26th ult., compared with those of the corresponding week of last year, the London and North-Western Railway Company announce a decrease of £20,000, and the Midland Company one of £10,000.

THREE POINTS

of advantage from the many found in our Slot Meters are:

1st.—They are Fraud Proof, and cannot be tampered with through the Slot.

2nd.—The Slot is closed when the maximum number of Coins have been inserted.

3rd.—Our Price-Changing System is the Simplest, Quickest, and most Accurate yet devised.

ALL PARTS INTERCHANGEABLE.

Tens of Thousands in use, and adopted exclusively by many Gas Companies.

WILLEY & CO., LTD., LONDON & EXETER.

AGENTS FOR SCOTLAND

D. M. NELSON & CO., 53, WATERLOO STREET, GLASGOW.

APPLICATIONS FOR LETTERS PATENT.

19,754.—Mudd, J., "Gas-burners." Sept. 21.
19,755.—Mitton, D., "Fittings for inverted burners." Sept. 21.
19,785.—Thomas, J., "Incandescent lamps and burners." Sept. 21.
19,838.—Furch, A., "Ball-joints for pipes." Sept. 22.
20,004.—Gunning, J., "Gas-lanterns." Sept. 23.
20,009.—Peacock, J. E., "Automatic gas-valve." Sept. 23.
20,014.—Lake, W. E., "Manufacture of gas." A communication from the International Gas Development Company. Sept. 23.
20,026.—Caldwell, H. M., and Smith, T., "Governing and regulating gas." Sept. 23.
20,043.—Fairweather, W., "Regulating the pressure of gases." A communication from M. Jaspersen. Sept. 23.
20,046.—Borderel, J., "Gas-stoves." Sept. 23.
20,049.—Sieben, H., "Controlling gas." Sept. 23.
20,076.—Bray, A., "Acetylene burners." Sept. 24.
20,093.—Spreadbury, R. J., "Combined trivet and vaporizing pan for gas-fires." Sept. 24.
20,099.—Kershaw, P. B. W., and Stutfield, G. H., "Combustion of liquid hydrocarbons and storage of the gases produced thereby to be used for the purposes of power, heating, or otherwise. Sept. 24.
20,128.—Lockhart, J., and Christie, W., "Prepayment meters." Sept. 25.
20,178.—Parker, T. & C. H., "Hydraulic mains." Sept. 25.
20,190.—Sloper, H. T., "Coin meters." Sept. 25.
20,197.—Dearnley, C. von, "Incandescent burners." Sept. 25.
20,246.—Jones, A. C., "Wind-proof lamps." Sept. 26.
20,285.—Booth, T. H., "Gas-irons." Sept. 26.

Instructions have been given by the Works Committee of the Westminster City Council for the gas consumed in the sewer-ventilating lamps in Dansey Yard and Carting Lane to be paid for by scale; the meters, which are now frequently tampered with, to be dispensed with. The cost of the alteration will be 25s. per lamp, exclusive of the re-instatement of the paving; and the annual cost per lamp, under the scale, for a consumption of 15 cubic feet of gas per hour, will be £16 15s. 6d.

"ILLUMINATING TRUTHS."

LEAFLETS FOR DISTRIBUTION.

No. 1.—"The Sanitary Aspects of Gas and Electric Lighting."
No. 2.—"The Cleanliness of Illuminants: The Eyesight."
No. 3.—"Fire Risks."
No. 4.—"The Relative Cost of Gas and Electricity, and Matters affecting it.
No. 5.—"On Reliability, with Instances of Misplaced Confidence."
No. 6.—"On Shop Lighting, with Special Reference to the Flame Arc Lamp."
No. 7.—"The Osram Lamp: Fiction and Fact.

This series of Leaflets will be useful, not only for distribution among Householders generally, but for circulation among Shareholders to fortify them with arguments in defence of the commodity in which they have invested capital. Copies of each Leaflet should also be kept in every Gas Undertaking's Show-Rooms.

Prices for Quantities on Application to WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

Manager and Secretary. No. 4997.
Manager. Greenock Gas Department. Applications by Oct 21.
Representative (Lighting). A 6418, c/o Schroeder's, Bucklersbury, E.C.
Representative (Meters). No. 4998.
Stokers. Arundel Gas-Works.

Situations Wanted.

Representative (Cookers and Meters). No. 4996.
Clerk or Collector. No. 5000.

Patents to Sell and Licences to Manufacture.

Improvements in Meters. Haseltine, Lake, and Co., Southampton Buildings, W.C.

Inventions Wanted to Exploit.

Lighting, Heating, or Gas Manufacturing Plant. No. 4999.

Stocks and Shares.

Ascot Gas and Electricity Company. Oct. 26.
Brighton and Hove Gas Company. Oct. 26.
Croydon Gas Company. Oct. 14.
Great Yarmouth Water Company. Oct. 20.
High Wycombe Gas Company. Oct. 20.
Mitcham and Wimbledon Gas Company. Oct. 26.
Pinner Gas Company. Oct. 26.
Sevenoaks Water Company. Oct. 31.
Southend Gas Company. Oct. 20.
Swanage Gas and Water Company. Oct. 20.
West Kent Gas Company. Oct. 26.

TENDERS FOR

Coke.
Huddersfield Gas Department. Tenders by Oct. 14.

Fire-Clay Goods.
Rochester, Chatham, and Gillingham Gas Company. Tenders by Oct. 12.

Oil for Gas Making.
Smethwick Gas Department. Tenders by Oct. 28.

Oxide of Iron.
Blackburn Gas Department.

Pipes, &c., and Pipe Laying.
Redditch Gas Company. Tenders by Oct. 17.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 26.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 10	10	Alliance & Dublin 10 p.c.	19–20	..	5 0 0
268,324	10	,,	7	Do. 7 p.c.	13–14	..	5 0 0
310,000	Stk.	July 15	4	Do. 4 p.c. Deb.	99–102	..	3 18 5
200,000	5	May 29	6¼	Bombay, Ltd.	5¾–6¼	..	5 4 0
40,000	5	,,	6¼	Do. New, £4 paid	4–4¼	..	5 15 7
50,000	10	Aug. 27	14	Bourne-mouth Gas and Water } 10 p.c.	28–29	..	4 16 6
51,810	10	,,	7	B 7 p.c.	16¼–16¾	..	4 3 7
53,200	10	,,	6	Pref. 6 p.c.	15–16	..	3 15 0
380,000	Stk.	Aug. 13	12½	Brentford Consolidated	244–249	..	5 0 5
300,000	,,	,,	9½	Do. New	182–187	+1	5 1 7
50,000	,,	,,	5	Do. 5 p.c. Pref.	120–125	..	4 0 0
706,250	,,	June 12	4	Do. 4 p.c. Deb.	100–105	..	3 16 2
220,000	Stk.	Sep. 11	10½	Brighton & Hove Orig.	205–210	..	5 2 4
246,320	,,	,,	7½	Do. A. Ord. Stk.	150–155	..	5 0 0
460,000	20	Mch. 27	10	British	42–43	..	4 13 0
109,000	Stk.	Aug. 27	6	Bromley, Ord. 5 p.c.	113–116	..	5 3 5
165,700	,,	,,	4½	Do. do. 3½ p.c.	84–86	..	5 4 8
500,000	10	May 14	7	Buenos Ayres (New) Ltd.	11¼–11¾	..	5 19 1
250,000	Stk.	June 26	4	Do. 4 p.c. Deb.	93–95	+1	4 4 3
150,000	20	July 15	7½	Cagliari, Ltd.	24–25	..	5 16 0
100,000	10	—	—	Cape Town & Dis., Ltd.	4–6	..	—
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref.	5–7	..	6 8 7
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	48–50	..	6 0 0
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	78–83	..	5 8 5
157,150	Stk.	Aug. 13	5	Chester 5 p.c. Ord.	108½–110½	..	4 12 7
1,493,280	Stk.	Aug. 27	5⅛	Commercial 4 p.c Stk.	106–111	+1	4 13 8
560,000	,,	,,	5	Do. 3½ p.c. do.	103–106	+2½	4 14 4
475,000	,,	June 26	3	Do. 3 p.c. Deb. Stk.	82–84	..	3 11 5
800,000	Stk.	June 12	6½	Continental Union, Ltd.	108–113	..	5 15 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	137–142	..	4 18 7
460,170	Stk.	—	5	Derby Con. Stk.	122–124	..	4 0 8
55,000	,,	—	4	Do. Deb. Stk.	103–105	..	3 16 2
148,995	,,	Sep. 30	5	East Hull 5 p.c. Ord.	97–100*	..	5 0 0
486,090	10	July 15	12	European, Ltd.	23–24	..	5 0 0
354,060	10	,,	12	Do. £7 10s. paid	16½–17½	..	5 2 10
15,182,590	Stk.	Aug. 13	4/10/8	Gas-light and Coke } 4 p.c. Ord.	99–100	..	4 10 8
2,600,000	,,	,,	3½	3½ p.c. max.	87–89	..	3 18 8
3,799,735	,,	,,	4	4 p.c. Con. Pref.	105–107	..	3 14 9
4,193,975	,,	June 12	3	3 p.c. Con. Deb.	85–87	..	3 8 11
258,740	Stk.	Sep. 11	4½	Hastings & St. L. 3½ p.c.	93–93	..	4 16 11
82,500	,,	,,	6¼	Do. do. 5 p.c.	112–115	..	5 8 8
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	18–19	..	5 15 9
4,940,000	Stk.	May 14	8	Imperial Continental	182–184	+1	4 7 0
473,600	Stk.	Aug. 13	3½	Do. 3½ p.c. Deb. Red.	94–96	..	3 12 11
195,242	Stk.	Aug. 27	6	Lea Bridge Ord. 5 p.c.	116–120	..	5 0 0
£			p.c.				£ s. d.
561,000	Stk.	Aug. 27	10	Liverpool United A	227–229	..	4 7 4
718,100	,,	,,	7	Do. B	166–168	+1½	4 3 4
306,083	,,	June 26	4	Do. Deb. Stk.	104–106	..	3 15 6
75,000	5	June 26	6	Malta & Medn., Ltd.	4¼–4¾	..	6 6 4
560,000	100	Oct. 1	5	Met. of } 5 p.c. Deb.	100–102*	+1½	4 18 0
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	99–101*	+¼	4 9 1
541,920	20	May 29	3½	Monte Video, Ltd.	11½–12½	..	5 12 0
1,775,892	Stk.	July 30	4/12/6	Newc'tle & G'tesh'd Con.	107½–108½	..	4 5 3
418,460	Stk.	June 26	3½	Do. 3½ p.c. Deb.	90–92	..	3 16 1
15,000	10	Aug. 27	10	North Middlesex 10 p.c.	19½–20½	..	4 17 6
55,940	10	,,	7	Do. 7 p.c.	13–14	..	5 0 0
300,000	Stk.	Apl. 29	8	Oriental, Ltd.	140–143	..	5 11 11
60,000	5	Sept. 30	8	Ottoman, Ltd.	6–6½*	+⅛	6 3 1
398,490	5	Apl. 29	7	Primitiva Ord.	5⅞–6¼	..	5 12 0
796,980	5	July 30	5	Do. 5 p.c. Pref.	4⅝–5⅛	..	4 17 7
488,900	100	June 1	4	Do. 4 p.c. Deb.	97–99	+1	4 0 10
1,000,000	10	Apl. 29	8	River Plate Ord.	13¼–13⅝	..	5 16 5
312,650	Stk.	June 26	4	Do. 4 p.c. Deb.	92–94	..	4 5 1
250,000	10	Sept. 30	8	San Paulo, Ltd.	13⅜–14*	+¼	5 14 4
125,000	50	July 1	5	Do. 5 p.c. Deb.	49–51	..	4 18 0
135,000	Stk.	Sept. 11	10	Sheffield A	239–241	..	4 3 0
209,984	,,	,,	10	Do. B	239–241	..	4 3 0
523,500	,,	,,	10	Do. C	238–240	..	4 3 4
70,000	10	May 29	10	South African	13⅜–14⅜	..	6 17 11
6,429,895	Stk.	Aug. 13	5/6/8	South Met., 4 p.c. Ord.	120–122	..	4 7 4
1,895,445	,,	July 15	3	Do. 3 p.c. Deb.	84–86	..	3 9 9
209 827	Stk	Aug. 31	8	South Shields Con. Stk.	152–154	..	5 3 10
£05,000	Stk.	Aug. 13	5/6/8	S'th Suburb'n Ord. 5 p.c.	115–118	..	4 10 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	117–122	..	4 2 0
117,058	,,	July 15	5	Do. 5 p.c. Deb. Stk.	120–125	..	4 0 0
502,310	Stk.	May 14	5	Southampton Ord.	108–113	..	4 8 6
120,000	Stk.	Aug. 13	6¾	Tottenham } A 5 p.c.	132–137	..	4 18 6
398,940	,,	,,	5¾	and } B 3½ p.c.	105–108	..	4 17 3
149,470	,,	June 26	4	Edmonton } 4 p.c. Deb.	100–105	..	3 16 2
182,380	10	June 12	8	Tuscan, Ltd.	10–10¾	..	7 12 4
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99–101	..	4 19 0
193,742	Stk.	Aug. 27	5	Tynemouth 5 p.c. max.	104–105	..	4 15 3
255,636	Stk.	Aug. 27	6¾	Wandsworth } B 3½ p.c.	125–130	+1	5 0 0
79,416	,,	June 26	3	and } 3 p.c. Deb. Stk.	73–78	..	3 16 11
845,872	,,	Aug. 27	5⅛	Putney			
185,000	,,	,,	5	West Ham 5 p.c. Ord.	101–104	+1	4 18 6
228,300	,,	June 26	4	Do. 5 p.c. Pref.	118–123	..	4 1 3
				Do. 4 p.c. Deb. Stk.	100–105	..	3 16 2

Prices marked * are "Ex div."